JLUMHS

Volume 21 Number 02 April - June 2022

JLUMHS is indexed and recognized by following International / National databases:

Directory of Open Access Journal (DOAJ)
Clarivate Analytics (Thomson Reuters) Master list in ESCI (Emerging Sources Citation Index).
Index Medicus for WHO Eastern Mediterranean Region (IMEMR)
Digital Object Identifier (DOI) by CrossRef
ICI World Journals (Index Copernicus International)
CiteFactor indexation
ICMJE (International Committee of Medical Journal Editors)
Google Scholar
SJR (Scimago) (13th position in Pakistan)
Higher Education Commission (HEC) of Pakistan in "Y" category
Pakistan Medical Commission (PMC)
Pakmedinet

JLUMHS is partially sponsored by Higher Education Commission of Pakistan.

INSIDE THIS ISSUE

Editorial

Postgraduate Education: The Innovative Development and Program Execution

Syed Zulfiquar Ali Shah, Muzaffar Ali Shaikh

This article may be cited as: Shah SZA, Shaikh MA. Postgraduate Education: The Innovative Development and Program Execution. J Liaquat Uni Med Health Sci. 2022;21(02):87-8.
doi: 10.22442/jlumhs.2022.00960

In Pakistan, education is regulated by the federal education department and the provincial governments, with the federal government principally assisting in curriculum development, licensing, and research and innovation financing. Pakistan's literacy rate is currently 62.3 percent, suggesting that 60 million individuals are illiterate. Teacher education reform is critical for enhancing education in Pakistan and impacts the country's comprehensive education. It is crucial in developing countries because it imparts essential life skills to future generations[1]. People in the health care and education spectrums have more authority after the eighteenth amendment was repealed in 2010. When talking about what it means to be a professional, we usually refer to high income, prestige, and influence, high educational requirements, relative autonomy, licensure, member commitment to the profession, codes of ethics, professional community cohesion, and monopoly over a task, skill, or practice[2].

According to the World Health Organization, around 59.2 million health care providers are working worldwide, with a shortage of nearly 3.4 million doctors, midwives, nursing staff, and staff members. Pakistan has 170,172 doctors, 13,422 dentists, 83,121 nurses, 39,000 midwives, 14,680 lady healthcare assistants (LHVs), and 33,522 chemists, according to the Economic Survey of Pakistan 2013-2014[3,4]. Two Physicians for every 1,000 people, one dentist for every 1,000 people, four nursing for every one doctor, and one chemist for every six physicians, according to international standards[3,4].

The health sciences postgraduate training program has existed in Pakistan for many years, with the introduction of master's, fellowships, diploma, and doctorate programs in various specialities recognized to train both doctors and related professions in Pakistan, due to a large number of instructors, research, and tutoring abilities as well as the Infrastructure for education and research, as well as financial capability.

The higher education commission (HEC) is a statutory agency; principal responsibilities include funding, monitoring, regulating, and accrediting the country's higher education institutions and a key role in developing a knowledge-based economy in Pakistan by awarding scholarships for study abroad[4,5]. College of physicians and surgeons Pakistan's premier postgraduate medical College was established in 1962 by parliament. The College's charter called for the establishment of postgraduate medical education, training, and research to promote the specialized medical practice. For decades, Liaquat University's academic staff have had higher qualifications domestically and abroad. The university has also offered postgraduate training programs with quality control and accreditation, as well as a variety of semi-health-related training programs (paramedical staff). In other Pakistani universities (both public and private), a base of competent academic staff with content understanding is also employed for various programs. Most of these professors possessed doctorate and fellowship degrees, continued teaching and research activities, well-established curriculum vitae and ongoing experience in their fields to vouch for qualitative and quantitative care.

Seminars on research methodology, bioethics, biostatistics and statistical analysis are held regularly, with students being dispatched to other institutions for extra training throughout their research work. The HEC and drug industries contribute educational and academic funds to e-Library, which produces a range of other digital online resources. In addition, each student enrolled in the programs was given a monthly stipend to ensure long-term stability. Furthermore, government institutions sponsored fee reductions for employees enrolled in postgraduate programs[6]. These postgraduate training programs increase advanced biomedical and scientific training, avoiding the social and economic problems associated with training overseas and significantly lowering expenditures[7].

Within the state, a considerable rise in university mentoring abilities could aid in developing research skills among academic staff and other health professionals by selecting and involving university employees as supervisory, co-mentors and co-supervisors of students enrolled. It's a significant step forward to developing a solid culture and using excellent investigative approaches to address the regional health challenges. The construction of postgraduate study and extension units in Pakistani universities has given them the ability to train a varied spectrum of professionals in various priority areas, as well as identify institutions and other sources for capacity building.

Bioinformatics capability and e-learning strategies

developed to support postgraduate studies have allowed for the extension of courses and academic connections across the country, as well as the reduction of disparities within different institutions across the country. Consequently, academic institutions in Pakistan have created academic ability to ensure and maintain teaching and research efforts, as well as infrastructure and staff retention in multi and trans-disciplinary modes. This will very certainly lead to long enhancements in care quality. Despite the achievement, barriers remain that could quash further progress in the process of learning, including i) language barriers, ii) the insufficient growth of research labs, lecture halls, and academic teaching aids, iii) increased costs of some courses, iv) health problems and inability to make payments without scholarships, which led to the abdication of studies, and v) the competing primary professional responsibilities of most students (due to difference in racism and cultural tradition)[8]. In Critical Care training, Levitt MA 1999[9] found no significant influence of mentoring financial assistance, research grants and prosperity on publication yield. Mentorship evaluations were related to research output, as per Vinci RJ et al.[10]

In Pakistan, these post-graduation programs are developing fellowship and doctoral programs through educational grants, laboratories and equipment resources in institutions and stakeholders and training programs established in resource-limited settings. Increased faculty and student & career development, promoting scientific growth and permitting university and faculty scientific, pedagogical, and academic management growth are possible targets.

Faculty members benefit from the experience, knowledge and networking that have resulted in ensuring long-term sustainability. Every one of the member organizations and faculty and staff helped contribute exceptional knowledge and skills to these ability schemes and innovations, and every department chair advantage from the expertise, experience, collaboration, and editorials that ultimately ensure long-term stability. This technique for developing postgraduate studies can be applied to various training programs in our country's institutions.

REFERENCES

1. Sabzwari SR. Health literacy in Pakistan: exploring new ways of addressing an old challenge. J Pak Med Assoc. 2017;67(12):1901-04.
2. Khan RQ, Khan HT, Iqbal M. Teaching the teacher: assessing barriers to identity formation of clinical teachers in a developing country. Teach Learn Med.2021:1-7. doi: 10.1080/10401334. 2021.1906255. Online ahead of print.
3. Abdullah MA, Mukhtar F, Wazir S, Gilani I, Gorar Z, Shaikh BT. The Health Workforce Crisis in Pakistan: A Critical Review and the Way Forward. World Health Popul. 2014; 15(3): 4-12.
4. Jawaid SA, Jawaid M. Revised publication policies by higher education commission for health science journals. Pak J Med Sci.2020;36 (2):1-3. doi: 10.12669/jpms.36.2.2133.
5. Ali S, Sethi A. Setting agenda for medical education research in Pakistan. Pak J Med Sci. 2021; 37(3): 684-88. doi: 10.12669/pjms.37.3. 3603.
6. Meo SA. Global standing of Pak universities in Shanghai ranking. Pak J Med Sci. 2018; 34(5): 1304. doi: 10.12669/pjms.345.16153.
7. Ellahi A, Zaka B. Analysis of higher education policy frameworks for open and distance education in Pakistan. Eval Rev. 2015; 39(2): 255-77. doi: 10.1177/0193841X15570046.
8. O'Sullivan B, McGrail M, Gurney T, Martin P. Barriers to getting into postgraduate specialty training for junior Australian doctors: an interview-based study. PLoS One. 2021; 16(10): e0258584. doi: 10.1371/journal.pone.0258584.
9. Levitt MA, Terregino CA, Lopez BL, Celi C. Factors affecting research directors' and residents' research experience and productivity in emergency medicine training programs. Acad Emerg Med. 1999; 6(4): 356-359. doi: 10.1111/ j.1553-2712.1999.tb00403.x.
10. Vinci RJ, Bauchner H, Finkelstein J, Newby PK, Muret-Wagstaff S, Lovejoy Jr. FH. Research during pediatric residency training: outcome of a senior resident block rotation. Pediatrics. 2009; 124(4): 1126-34. doi: 10.1542/peds.2008-3700.

AUTHOR AFFILIATION:

Dr. Syed Zulfiquar Ali Shah
(Corresponding Author)
Assistant Professor, Department of Medicine
Liaquat University of Medical and Health Sciences (LUMHS), Jamshoro, Sindh-Pakistan.
Email: zulfikar229@hotmail.com

Dr. Muzaffar Ali Shaikh
Department of Medicine
LUMHS, Jamshoro, Sindh-Pakistan.

Review Article

Knowledge and Practice among Public Health Nurses in Disaster Response Phase

Ardia Putra, Hajjul Kamil, Yuswardi Yuswardi, Budi Satria

ABSTRACT

A disaster can be delineated as an occurrence that threatens and disrupts people's lives and means of subsistence caused by natural, non-natural, and human factors, resulting in loss of life, environmental damage, loss of property, and psychological consequences. As a flexible profession that covers all conditions, nurses, particularly PHNs, are expected to be limited to providing care in the community and required to work in conditions of disaster emergency response. This literature review aims to identify the knowledge and perceived ability to practice of PHNs in the disaster emergency response phase. The study is based on a systematic review approach. The source of information for the present study derived from Internet-based literature, in the form of research results from online libraries at the local, national and international levels. Totally 43 references were used to establish this review study. The knowledge and perceived ability to practice PHNs in the disaster response phase will typically be identified in six viewpoints: warning, triage of disasters, saving and stabilizing lives, surveillance, risk communication, and technical skills. Therefore, handling situations among the alert and steady states is quite atypical; hence nurses must skillfully and technically deal with these conditions.

KEYWORDS: Nurses, Public Health Nurses, Disaster Management, Disaster Nursing, Response Phase

This article may be cited as: Putra A, Kamil H, Yuswardi Y, Satria B. Knowledge and Practice among Public Health Nurses in Disaster Response Phase. J Liaquat Uni Med Health Sci. 2022;21(02):89-96. doi: 10.22442/jlumhs.2022.00918. Epub 2022 April 22.

INTRODUCTION

Indonesia is threatened by disasters every year. Over the last decade, Indonesia, a country predisposed to disasters, has been hit by natural disasters with significant casualties. direct losses, and infrastructure damage[1]. The last major earth quake, followed by a tsunami, impacted December 2004 Aceh and some parts of North Sumatra, more than 150,000 people died[2]. In general, a disaster is specified as an occasion that disrupts the functioning of a community resulting in the need for external resources to maintain essential services[3]. Natural disasters often occur suddenly or unexpectedly[4]. While, man-made disasters can occur due to mistakes, negligence, or deliberate damage such as bioterrorism, explosive threats, epidemics, fires, radiation leaks, and war[5]. In brief, a disaster is a condition in which the destructive effect of a natural or human-induced event exceeds the available resources required by the society or territory[6].

Today, Indonesia has changed its disaster management strategy. Here, PHNs will be played an important role in collaborating with other healthcare providers since they know well about the basic information regarding communities and populations which benefit them in disaster management[7]. For instance, the PHNs in the USA identified their roles while facing a disaster that attacked in late August 2005. They could render the care along with the nightmare of collapsed infrastructure, depleted resources, disoriented and destitute evacuees, fractured social networks, environmental degradation, and personal physical exhaustion[8].

However, several critical factors in an effective disaster management plan, such as public knowledge, health service involvement, comprehensive training, protocols, technology, and effective communication, are still far from expectations[9]. Thus, the responsibility and participation of various cross-sectors are essential, including the government, various community organizations, and the community together with health service providers, especially nurses[10].

Nurses are the most significant health workers from other health care teams who need regular training to maintain the skills and competencies required during disasters to save lives and protect victims during catastrophe[11]. However, there may be a gap between knowledge and practice because of inadequate and discontinuous preparation for disaster response. An earlier study from Hsu et al.[12] revealed that PHNs consider themselves insufficiently prepared for disasters because of limitations in their participation in several training practices as an essential element of disaster preparedness. Moreover, studies on the perception of PHNs in disaster management revealed that most of them often feel they are missing out on opportunities to attend a training course or a disaster-related education session, did not participate in

Received: ***30-09-2021***
Revised: ***07-03-2022***
Accepted: ***12-04-2022***
Published Online: ***22-04-2022***

disaster exercises to prepare for a disaster, or limited communication, planning, supplies, and equipment. It makes them unsure how to respond to a catastrophe[5,13].

This study will investigate the contribution of disaster management, particularly in the response phase. The study's specific objectives include exploring the existing disaster management guideline, particularly in the response phase, and describing the PHNs' knowledge and perceived ability to practice in the response phase. In the early stages, it is necessary to save many lives. During this time, nurses provide physical, psychological, and holistic care for persons, families, and communities whose priority is given to susceptible groups such as pregnant women, children, and seniors[14]. In addition, the nursing profession, especially PHNs, can perform medical assistance and treatment in a disaster response situation. Therefore, PHNs must have good knowledge and skills to provide disaster emergency assistance in various forms.

METHODOLOGY

The study is based on a systematic review approach. The source of information for the present study derived from Internet-based literature, in the form of research results from online libraries locally, nationally, and internationally.

References search based on inclusion criteria were all articles originating from research articles, such as research on disaster nursing in community and clinical areas. Moreover, systematic review papers responded to the search question: whether there is already available guideline related to disaster nursing or disaster management. The exclusionary criteria were items that did not match the research question and were published in the last 20 years.

The various methods were applied using the variant line to search relevant published papers and other extensive reports from the standard nursing and health-related databases. Databases used include PubMed, CINAHL, ProQuest Medical Library, and Mendeley from 2001 to 2021. In addition, the universal web-based case entry (Google-web or G-scholar) was also used. Articles qualified or meeting the criteria were selected on a systematic basis.

One researcher conducted the literature search seven

TABLE I: SUMMARY OF THE DISASTER MANAGEMENT GUIDELINES IN THE DISASTER RESPONSE PHASE

Author, year, country	Population	The response phase of disaster management	Competencies
[18], 2002, Canada	All parts of the health sectors: PHC system, PHN, and communities	*Hazard assessment:* This component will be included understanding the risk of hazard or disaster, vulnerability population, and coping resources *Risk management:* This component will be included risk estimation, risk evaluation, and risk control	*Hazard assessment:* a. Identify the possible risk of disaster b. Identify the vulnerability population to disaster impacts c. Identify the agency and other resources in the community to cope with disaster impacts *Risk management:* a. Estimate the possible loss from the disaster b. Evaluate the number of disaster impacts c. Ensure recovery will be established after the disaster
[19], 2005, Sri Lanka	Health sectors	*Warning:* It aims to warn the community in case of disaster adequately. *Emergency:* It aims to limit the number of disaster victims and deliver appropriate care in a chaotic situation.	*Warning:* a. Provide information to the community in case of a disaster. b. Identification of the source, content, and disaster alert mechanism. *Emergency:* a. Conduct health services during an emergency, which includes primary health care in an emergency, control of infectious disease, immunization, public health surveillance, and primary health care and outreach b. Conduct initial needs assessment in displaced populations, including water/sanitation, food/nutrition, shelter/site plan, health service, and coordination between health resources.
[5], 2007, USA	Occupational and environmental health professionals' including nurse	*Event (response/relief):* The response phase refers to immediate actions in an emergency and during a disaster based on the type or level of disaster.	*Event (response/relief):* a. Notify a disaster event to the community b. Perform initial response immediately during the disaster c. Develop chain command structure and scene assessment. d. Perform search and rescue for disaster victims e. Conduct victim extrication f. Perform disaster triage g. Provide care for stabilization of victim's condition h. Transport the victims who need further care
[20], 2004, USA	Community/ PHNs (C/PHNs)	*Phase II (Disaster):* Roles of C/PHNs in this phase will be included a caregiver, case managers, and educators.	*Phase II (Disaster):* a. Perform triage to prioritize care and provide holistic care for disaster victims as a caregiver b. Maintain liaison interagency and community, provide health service referrals, maintain coordination of health services, and establish a system to track patients that have been treated were included as case manager roles. c. Incorporate secondary levels of prevention of health problems were included as educator roles.

times, from March 1 to August 31, 2021. Some keywords were utilized to derive those articles: disaster management, disaster nursing, response phase, nursing roles, public health nurse, PHNs competencies in disaster, search and rescue, triage, first aid, and victim's evacuation. Following a systematic search, 43 references have been chosen for this study: 14 research articles, five feature articles, 12 review articles, six guidelines articles, four books, and two reports.

FINDINGS AND DISCUSSION

Disaster Management Guideline

Since the Florence Nightingale era, she had implemented the role and responsibility of caring for disaster victims[15]. No single entity, discipline, agency, organization, or jurisdiction can assert responsibility for the complex set of challenges associated with disasters and emergencies. However, PHN expertise must be leveraged in all stages of the disaster cycle: mitigation, preparedness, response, and recovery[16].

On the other hand, nurses recognize that they are less involved in the workplace and act in vital legislation, policy systems, and regulations that can strengthen and support practice in any circumstance[17]. Therefore, their contribution to the national action plan to improve their knowledge and practices concerning disaster management is limited. Some have introduced Disaster Management Guidelines, and many organizations and experts have developed a Nursing Disaster Management Model for Comprehensive Disaster Management; these are included the Manitoba Health[18], WHO[19], Rogers and Lawhorn[5], and a framework from Jennings-Sanders[20]. These resources are valuable for healthcare providers, particularly nurses, to guide and bring up their actions in disaster events[21]. Details for each guidance presented in **Table I**.

PHNs' Knowledge and Perceived ability to Practice in Emergency Response Phase

The Essential Skills of the Disaster Management Guidelines outlined in Table I will be used to ascertain the knowledge and perceived ability to practice PHNs in this study. Although disaster management capabilities have not been fully described, critical expertise and perceived ability to implement successful disaster management have been demonstrated in every disaster phase process. Moreover, further evidence from Martono M 2019[10], Sultan MA 2018[11], Magnaye B 2011[16], Polivka BJ et al.[7], Vogt V 2008[4], and Kuntz SW 2008[21], and many others have been utilized to support specific disaster management skills for PHNs, including the contribution of PHNs during the disaster response phase.

Response refers to the implementation phase of an emergency plan[22]. The first step in this phase is to issue a proper warning to the community about a disaster[5,19]. Nevertheless, the primary focus during this phase is on saving a life, first-aids, and emergency treatment[23]. Afterwards, PHNs should develop a disaster triage strategy to track victims and prioritize appropriate care[5,20]. Once completed, they are expected to continue providing life-saving and life-sustaining care to those affected[19]. To achieve this, PHNs need adequate technical skills[7].

Furthermore, PHNs must calculate and assess the magnitude of the impact of a disaster using the surveillance method[18-19]. Finally, to maintain collaboration and coordination between health care services and inform the community of disaster risks, PHNs should familiarize themselves with the communications equipment. The chain command structure and coordination between health care resources can be sustained[5,20]. The disaster response phase detailed the knowledge and perceived ability to practice for PHNs.

1- Early warning

PHNs need to be concerned about the response phase's warning, pre-impact, mobilization, and evacuation priority. Here, it is crucial to assess the preparedness of PHIs for future disasters. Catastrophe, particularly natural disasters, is mainly generated unintentionally and without specific warning[4]. As the first-line responder, PHNs must prepare to gain the knowledge and skills to care for disaster survivors and prepare for future disasters[24].

The first action to be concerned with is sending a proper warning to the commonwealth of the catastrophes[5,19]. According to Vogt V 2008[4], more precise information on sources and systems used, such as the responsible person sending the warning information to the community, including regular training is needed. An adequate warning also will be informed to a community to prepare appropriately. The contributing warning factors such as source, content, mechanism, individual perception, and belief can influence people to evacuate if a disaster occurs[4]. So, transparent information and knowledge on resources[23] and gradually skill development[4] and continuous support to affected person and communities are required[15].

Moreover, PHNs also think creatively and generate manual or technological equipment for early detection and send notifications[25]. A specific plan, including the designation of a well-trained spokesperson, is also needed to develop for each community area compatible with local or communications planning[26]. For example, the warning and announcement can be made from a mosque or other religious services in the Islamic community. In summary, adequate notice will allow the community to evacuate themselves and decrease the morbidity and mortality rate from disaster occurrences.

2- Disaster triage

The nurse's domains of role as early responding in the disaster include preventing the damage to the

patients, triage, first aid, resuscitation, mobilization, and evacuation[11]. Disaster triage was used to prioritize patient care needs during the day, mainly when resources (typical beds) are limited[27]. In a disaster situation, triage refers to a system used where available resources are inadequate to meet the needs of all victims. Therefore, the accurate disaster triage system is the most critical initial medical function during a mass casualty. Here, ethical considerations such as "do as little as possible, for as many as possible, as quickly as possible" must be highly concerned with triage used[27].

PHNs and other healthcare providers must first do primary or pre-hospital triage to classify the victims at the disaster scene. The plan should also cover the number of all victims[28]. According to triage competency, PHNs need to identify their capabilities in a disaster event to assure that all population and survivor needs will be covered[7], because during the response phase, nurses need to accomplish a primary triage that will be occurred during the period of the victims' initial assessment at the disaster site[27].

Lerner EB et al.[28] have identified at least nine mass casualty triage systems: START, Jump START, Homebush, Triage Sieve, PTT, CareFlite, STM, Militar Triage, and CESIRA, including two pediatric-specific systems. The most common primary triage type system used in a disaster situation is the START triage[27-28].

As the requirement of PHNs during the disaster event, knowledge about disaster triage is required to deliver appropriate care for injured victims before they are transferred to get further treatment in the hospital[29]. Limited expertise in this competency might occur because the subjects in this study may refer to the concept of daily triage, which is regularly performed in hospitals, especially in the ED[27]. In addition, a study led by Mitani S 2003[29] found that about a third of nurses did not seem aware of the principles of disaster triage and that about 39.8% of nurses did not understand the techniques.

A study conducted by Kahn CA 2009[30] compares the triage codes assigned to 132 patients with their results showing that 48.5% of patients were sorted correctly, 49.2% were over-sorted, and 2.3% were under-sorted. The result reflected the discrepancy between the sorting levels assigned by START during a train crash and the a priori outcome criteria for each group[31]. The START triage system can ensure suitable levels of sub-triage (100% red sensitivity and 89% green specificity) but incorporates a significant number of over-triage. START is also helpful for prioritizing the transportation of the most critical patients to local hospitals[30].

In short, effective disaster response requires knowledge, skills, and regular rehearsals[32]. In this case, PHNs must be educated and enabled to remain in their population-based specialty to screen and assign treatment priorities to the survivor[33]. Thus, survivor-focused care during the disaster can be delivered with the appropriate care for many victims.

3- Life-saving and stabilization

Providing life-saving and support to disaster-affected individuals and communities will be the following significant action[15]. Here, PHNs must engage in life-saving and stabilization of victims through rescue efforts, first aid, and emergency treatment[23]. Therefore, performing these activities requires appropriate knowledge and skills to deliver essential care in emergency response[15].

Immediately responding and helping manage the victims' health problems is necessary to minimize the life-threatening and the arrangement for advanced care needs. INCMCE has described several knowledge and skills to establish care for disaster victims, including basic first aid skills and primary assessments from head to toe. The detailed evaluation includes integument (e.g., wound, burn, and rash), airway, respiratory, cardiovascular (e.g., vital signs recording and signs of shock monitoring), pain; gastrointestinal, including sample collection; baseline neurological assessment; and musculoskeletal assessment[23].

From this, PHNs should establish regular first aid training to competent their life-saving skills such as external haemorrhage management, airway fixation, fracture coupling, and proper techniques to treat injuries[26]. Knowledge and skills on BLS and ALS are also vital for first-line responders[34-35].

4- Surveillance

In mass casualty incident management, a regular surveillance system is necessary to obtain data regarding injury, morbidity, mortality rate, and disease and illness[26]. According to Rothman KJ 2008[36], surveillance refers to collecting, managing, analysing, interpreting, and disseminating or reporting data regarding health problems that will be used to generate prevention programs. It is also used to determine changes in the nature or extent of health problems and whether public health interventions are effective[37]. Furthermore, surveillance provides information based on baseline epidemiological parameters (time, location, and people). It includes descriptive information on the time and site of health problems and the people affected[36].

As a member of the PHS and the role to identify and interview those at risk of disaster, PHNs should actively participate in epidemiological and surveillance projects and participate in disease outbreak investigations[38]. It has become clear that PHNs are critical to meeting surge capacity needs, whether those needs are in the area of surveillance, in shelter facilities, or massive drug distribution and vaccination centers[16,38].

As a relevant contributing factor in the event of a disaster, the ASTDN points out that PHNs need to be

competent in epidemiological surveillance and infectious disease investigations[15]. Indeed, surveillance helps obtain important disaster data to employ appropriate health care personnel and equipment[23]. Rogers and Lawhorn's research[5] also indicates that 48% of respondents indicated monitoring health during a hurricane disaster.

Other research by Akins RB 2005[39] regarding the ability of PHNs to participate in disease surveillance found that nurses with minimal clinical skills can enhance their skills while working in the community. Community service signings will improve their clinical expertise in PHN. After that, PHNs will be better prepared to handle disasters[39].

In short, PHNs should be actively involved in the epidemiological and surveillance functions of the PHC and participate in post-disaster outbreak investigations[38] because nurses are considered to have the ability to identify and interview people with potential disaster exposure by performing several activities, including contact tracing and leading investigations, involving surveillance and notification, compiling the specimens, handling immunizations and enlightening the society, and continuing to be critical players in the local and national level emergency response[16].

5- Risk communication

To deliver adequate healthcare service, every PHNs should know the lines of command and communication when responding to an emergency[15]. Nurses must pay attention to the communication chain, identify the capabilities of their partners in operating programs, document, ensure access to medical equipment storage facilities, provide information to victims, and be prepared to use other communication tools[40].

While they can assist in many ways, they are more likely to be assigned to 'operations' because they bring leadership aptitude, a broad understanding of public systems, and nursing competencies. They are also considered to know how to design an organizational structure more likely to relate to the organization's command structure in an emergency[41].

As mentioned previously, collaboration and communication within and between the agencies are essential throughout the emergency response[25]. To determine successful collaboration and inform the community about the risk of disaster, PHNs need to be well-known and develop skills in functioning all disaster communication devices in their authority, according to local emergency disaster plan (e.g., facsimile, handy talkie, BB devices, email, portable computer, satellite phones, and handphones)[41].

Before disasters occur, each organization or authority should inform their specific roles and obligations during a disaster. This information must disseminate to the staff in both internal and external agencies since all disaster responders need to know their and others' communication roles to conduct effective communication and coordination. Lack of staff knowledge and skill in utilizing the communicating plans and device types will lead to inadequacy in performing the plan and failure in communication and coordination if a disaster occurs[25]. Here, detail of the roles and responsibilities of each organization must be captured in the Disaster Response Plan and need to evaluate both the plan and one own competency at least once a year by the staff[15].

6- Technical skills

The essential technical skills in responding to disaster events include administering medicines and vaccines to mass distribution centres, investigating cases, and using PPE[7]. Since disasters are unforeseeable and not a routine occurrence, it is maybe impossible to pre-specify the type of injuries that might be happening, the numbers of victims, and the type of disaster occasion. Thus, nurses can prepare and develop their competence in responding to disaster events based on a standardized plan or evidence-based knowledge[25]. The pre-requisite knowledge and skills needed during a disaster include administering medication[41], including vaccination or immunization, and infectious diseases prevention due to disease outbreaks prevention from natural disasters[42]. An adequate medication stockpile related to vaccination used in an emergency (e.g., measles, Hep A, and tetanus) is also needed to supply[19].

Moreover, PHNs should recognize the utilization of vaccination/immunization for disaster victims. For example, one case of measles is sufficient to support measles control activity, including measles immunization[43]. Hep A vaccine is not recommended to prevent an outbreak in the affected area. Preventing Hepatitis A outbreaks in small communities is practical when vaccination begins early during the outbreak[42]. The comprehensive tetanus vaccine program is not indicated and is only suggested for people with large open wounds or other injuries. This vaccination should be conducted concurrently with other preventative measures[43].

Furthermore, the disease outbreaks following the natural disaster must prioritize concern for PHNs to prevent an epidemic. Public health should ensure that the displaced people's shelters have proper sanitation and personal hygiene, clean water and appropriate nutrition, vaccinations, vector control, and health education[43]. They should conduct cases investigation by identifying many aspects, including a) endemic and epidemic diseases commonly found in the affected area; b) the living conditions of the affected population, including the number, size, location, and density of the facilities; c) access to clean water and adequate sanitation facilities; d) the underlying nutritional state and vaccine coverage within the population; and e) the level of access to health care

services and effective case management[42]. With adequate information from the investigation, it would be helped PHNs to develop an appropriate plan to prevent the diseases and illnesses from spreading.

To enlighten, PHNs also considered having knowledge and skill in using standard equipment daily. However, PHNs may need to use equipment not part of daily emergency practices. Recognizing the settings to which PHNs may likely be shipped off allows them to determine in advance how such things should be used. PHNs may need to be aware of not only the standard PPE used in an organization's infection control plan (e.g., gloves, gowns, and respirators) but also with advanced stuff and procedures used in crises (e.g., donning and doffing full-body suits, setting up, and using decontamination device)[25,41]. This knowledge and practice will help protect PHNs from disease contamination when delivering healthcare services to disaster victims.

CONCLUSION

The increasing incidence of disasters worldwide makes every country ready to face the unexpected, including natural disasters. Therefore, proper disaster management in all phases of disaster is crucial to establish. Although multiple disciplines are required to support disaster management, nurses, particularly PHNs, are viewed as one of the health professions that must be trained to deal with natural disasters. Consequently, there is an urgent need to increase awareness among nurses working in high-risk areas in a disaster. In addition, nurses must prepare with essential knowledge and skills to respond to disasters. While PHC and health decision-makers are responsible for developing appropriate training and education in a disaster such as BLS, ALS, disaster triage, risk communication, and technical skills for all PHNs and other health providers as first responders in disaster, then, coordination between the Health Division and other agencies is necessary to develop routine disaster drills across health care providers and communities to improve self-knowledge and preparedness in the event of a disaster.

Conflict of Interest: There is no conflict of interest among the authors.

Financial Disclosure / Grant Approval: There was no funding agency.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Putra A: Manuscript writing and data collection
Kamil H: Writing and editing supervision
Yuswardi Y: Reference writing and editing
Satria B: Data collection and grammar correction

ABBREVIATION

***ASTDN**: Association of State and Territorial Directors of Nursing*
***ALS**: Advanced Life Support*
***BLS**: Basic Life Support*
***ED**: Emergency Department*
***INCMCE**: International Nursing Coalition for Mass Casualty Education*
***PHC**: Public Health Center*
***PHNs**: Public Health Nurses*
***PHN**: Public Health Nursing*
***PPE**: Personal Protective Equipment*
***PTT**: Pediatric Triage Tape*
***START**: Simple Triage and Rapid Treatment*
***STM**: Sacco Triage Method*

REFERENCES

1. Pascapurnama DN, Murakami A, Chagan-Yasutan H, Hattori T, Sasaki H, Egawa S. Integrated health education in disaster risk reduction: Lesson learned from disease outbreak following natural disasters in Indonesia. Int J Disaster Risk Reduction. 2018; 29: 94-102. doi: 10.1016/j.ijdrr.2017.07.013.
2. Pratama AN. Dec 26, 2004, Aceh Earthquake and Tsunami Caused Grief in Indonesia. (in Indonesia). 2018. Available from: https://nasional.kompas.com/read/2018/12/26/11213301/26-desember-2004-gempa-dan-tsunami-aceh-menimbulkan-duka-indonesia?page=all.
3. Ranse J, Hammad K, Ranse K. Future considerations for Australian nurses and their disaster educational preparedness: a discussion. Aust J Emerg Manag. 2013; 28(4): 49-53.
4. Vogt V, Kulbok PA. Care of client in disaster settings community health nursing: Advocacy for population health. New Jersey: Pearson Prentice Hall; 2008. p. 759–800.
5. Rogers B, Lawhorn E. Disaster Preparedness: Occupational and environmental health professionals response to Hurricanes Katrina and Rita. AAOHN J. 2007; 55(5): 197-207. doi: 10.1177/216507990705500506.
6. Putra A, Kamil H, Yuswardi Y, Wardani E. What Should Public Health Nurses Do in the Preparedness Phase of Disaster? Open Access Macedonian J Med Sci. 2021; 9(F): 724-9.
7. Polivka BJ, Stanley SAR, Gordon D, Taulbee K, Kieffer G, McCorkle SM. Public Health Nursing Competencies for Public Health Surge Events. Public Health Nurs. 2008; 25(2): 159-65. doi: 10.1111/j.1525-1446.2008.00692.x.
8. Hays JC. Surge Capacity of Public Health Nurses. Public Health Nurs (Boston, Mass). 2008; 25(4): 293-4. doi: 10.1111/j.1525-1446.2008.00708.x.
9. Marthoenis M, Yessi S, Aichberger MC, Schouler-Ocak M. Mental health in Aceh – Indonesia: A decade after the devastating tsunami 2004. Asian

J Psychiatr. 2016; 19: 59-65. doi: 10.1016/ j.ajp.2016.01.002.
10. Martono M, Satino S, Nursalam N, Efendi F, Bushy A. Indonesian nurses' perception of disaster management preparedness. Chin J Traumatol. 2019; 22(1): 41-6. doi: 10.1016/j.cjtee. 2018.09.002.
11. Sultan MA, Mary PE, Al Grad HS. Emergency Nurses Readiness for Disaster Response - An Explorative Study. Am Res J Nurs. 2018;4(1):1-10.
12. Hsu EB, Thomas TL, Bass EB, Whyne D, Kelen GD, Green GB. Healthcare worker competencies for disaster training. BMC Med Educ. 2006; 6: 19. doi: 10.1186/1472-6920-6-19.
13. Fung OWM, Loke AY, Lai CKY. Disaster preparedness among Hong Kong nurses. J Adv Nursing. 2008; 62(6): 698-703.
14. Husna C, Kamil H, Yahya M, Tahlil T. An Intervention Program to Improve Nurses' Competencies in Disaster Response: A Mixed-Methods Study Protocol. Belitung Nursing J. 2020; 6(3): 85-90.
15. Jakeway CC, LaRosa G, Cary A, Schoenfisch S. The Role of Public Health Nurses in Emergency Preparedness and Response: A Position Paper of the Association of State and Territorial Directors of Nursing. Public Health Nurs. 2008; 25(4): 353-61.
16. Magnaye B, Munoz MS, Munoz MA, Munoz RG, Muro JH. The Role, Preparedness and Management of Nurses During Disasters. E Int Sci Res J. 2011; III(4): 269-94.
17. Boatright C, McGlown KJ. Homeland Security Challenges in Nursing Practice. Nurs Clin North America. 2005; 40(3): 481-97.
18. Manitoba Health. Disaster management for the health sector, Guideline for Program Development. Manitoba Health Disaster Management. 2002. Available from: https:// terrorvictimresponse.ca/wp-content/ uploads/2013/10/model.pdf.
19. Karunathilake IM, Abdullah A (eds). Guidelines for disaster management, A compilation of expert guidelines on providing healthcare. Faculty of Medicine, University of Colombo, Sri Lanka. Publication Year: 2005.
20. Jennings-Sanders A. Teaching disaster nursing by utilizing the Jennings Disaster Nursing Management Model. Nurse Educ Pract. 2004; 4 (1): 69-76. doi: 10.1016/S1471-5953(03)00007-6.
21. Kuntz SW, Frable P, Qureshi K, Strong LL. Association of Community Health Nursing Educators. Disaster Preparedness White Paper for Community/Public Health Nursing Educators. Public Health Nurs. 2008; 25(4): 362-9. doi: 10.1111/j.1525-1446.2008.00717.x.
22. Qureshi K, Gebbie KM. Disaster Management. In: Veenema, editor. Disaster Nursing and Emergency Preparedness for Chemical, Biological, and Radiological Terrorism and Other Hazard. 2nd ed. New York: Springer Publishing Company. 2007. p. 137–60.
23. Davies K. Disaster preparedness and response: more than major incident initiation. Br J Nurs. 2005; 14(16): 868-71. doi: 10.12968/bjon.2005.14. 16.19730.
24. WHO. The contribution of nursing and midwifery in emergencies: report of a WHO consultation. WHO headquarters, Geneva 22-24 November 2006.
25. Gebbie KM, Qureshi K. Emergency and Disaster Preparedness: Core Competencies for Nurses: What every nurse should but may not know. Am J Nurs. 2002; 102(1): 46-51. doi: 10.1097/00000446 -200201000-00023.
26. World Health Organization (2007). Mass casualty management systems: strategies and guidelines for building health sector capacity. Geneva: World Health Organization. https://apps.who.int/iris/ handle/10665/43804.
27. Sztajnkrycer MD, Madsen BE, Alejandro Báez A. Unstable Ethical Plateaus and Disaster Triage. Emerg Med Clin North Am. 2006; 24(3): 749-68. doi: 10.1016/j.emc.2006.05.016.
28. Lerner EB, Schwartz RB, Coule PL, Weinstein ES, Cone DC, Hunt RC et al. Mass Casualty Triage: An Evaluation of the Data and Development of a Proposed National Guideline. Disaster Med Public Health Prep. 2008; 2 Suppl 1: S25-34. doi: 10.1097/DMP.0b013e318182194e.
29. Mitani S, Kuboyama K, Shirakawa T. Nursing in Sudden-Onset Disasters: Factors and Information that Affect Participation. Prehospital and Disaster Medicine. Cambridge University Press. 2003; 18 (4): 359-65.
30. Kahn CA, Schultz CH, Miller KT, Anderson CL. Does START Triage Work? An Outcomes Assessment After a Disaster. Ann Emerg Med. 2009; 54(3): 424-30. doi: 10.1016/j.annemerg-med.2008.12.035.
31. Garner A, Lee A, Harrison K, Schultz CH. Comparative analysis of multiple-casualty incident triage algorithms. Ann Emerg Med. 2001; 38(5): 541-8. doi: 10.1067/mem.2001.119053.
32. Halpern JS, Chaffee MW. Disaster Management and Response. Nurs Clin North Am. 2005; 40(3): 419-594.
33. Baker MS. Creating Order from Chaos: Part I: Triage, Initial Care, and Tactical Considerations in Mass Casualty and Disaster Response. Military Medicine. 2007; 172(3): 232–6. doi: 10.7205/ MILMED.172.3.232.
34. Coyle GA, Sapnas KG, Ward-Presson K. Dealing with disaster. Nurs Manag. 2007; 38(7): 24-9. doi: 10.1097/01.NUMA.0000281132.18369.bd.
35. Supe A, Satoskar R. Health services responses to disasters in Mumbai sharing experiences. Indian J

Med Sci. 2008; 62(6): 242-51.
36. Rothman KJ, Greenland S, Lash TL. Modern Epidemiology. Vol. 3. Wolters Kluwer Health/ Lippincott Williams & Wilkins Philadelphia; 2008.
37. Veenema TG. Disaster nursing and emergency preparedness. 4th ed. New York. Springer Publishing Company; 2018. Available from: https://lccn.gov/2018016746
38. Rowney R, Barton G. The Role of Public Health Nursing in Emergency Preparedness and Response. Nurs Clin North Am. 2005; 40(3): 499-509. doi: 10.1016/j.cnur.2005.04.005.
39. Akins RB, Williams JR, Silenas R, Edwards JC. The Role of Public Health Nurses in Bioterrorism Preparedness. Disaster Manag Response. 2005; 3(4): 98-105. doi: 10.1016/j.dmr.2005.07.004.
40. Sharififar S, Hamidi Farahani R, Khoshvaghti A, Ahmadi Marzaleh M. Designing and Validation of the Nurses' Preparedness to Response to COVID-19 Questionnaire in Iran. Disaster Med Public Health Prep. 2021; 1-7. doi: 10.1017/dmp.2021.233.
41. Stanley JM. Disaster Competency Development and Integration in Nursing Education. Nurs Clin North Am. 2005; 40(3): 453–67. doi: 10.1016/j.cnur.2005.04.009.
42. Watson JT, Gayer M, Connolly MA. Epidemics after Natural Disasters. Emerg Infect Dis. 2007; 13(1): 1-5. doi: 10.3201/eid1301.060779.
43. Waring SC, Brown BJ. The Threat of Communicable Diseases Following Natural Disasters: A Public Health Response. Disaster Manag Response. 2005; 3(2): 41-7. doi: 10.1016/j.dmr.2005.02.003.

AUTHOR AFFILIATION:

Ardia Putra
Department of Nursing Management
Faculty of Nursing, Syiah Kuala University
Banda Aceh, Indonesia.

Hajjul Kamil (*Corresponding Author*)
Department of Nursing Management
Faculty of Nursing, Syiah Kuala University, Jl. Tgk. Tanoh Abee, Darussalam, Kec. Syiah Kuala
Banda Aceh, Aceh, 23111, Indonesia,
Email: hajjul.kamil@unsyiah.ac.id

Yuswardi Yuswardi
Department of Nursing Management
Faculty of Nursing, Syiah Kuala University
Banda Aceh, Indonesia.

Budi Satria
Department of Community Nursing
Faculty of Nursing, Syiah Kuala University
Banda Aceh, Indonesia.

Original Article

RIPASA Scores; a Reliable Score for Diagnosis of Acute Appendicitis

Abdul Malik Magsi, Mariam Malik, Mohammad Iqbal Khan

ABSTRACT

OBJECTIVE: To establish the diagnostic precision of the RIPASA score for Acute Appendicitis taking histopathology as a gold standard.

METHODOLOGY: Cross-Sectional Study using non-probability consecutive sampling including 484 patients of both gender with migratory abdominal pain to right iliac fossa < 7 days, Fever ≥101°F, and WBC >10000mm^3. This study was carried out at General Surgery Department, Jinnah Postgraduate Medical Centre Karachi, from May 2017 to February 2018.Patients with ASA scores III-VI, gangrenous appendicitis, peritonitis, and pregnant women were excluded. RIPASA score was assessed on admission, score summated, and had no effects on management. A score> 7.5 was considered positive for acute appendicitis. The diagnosis was made clinically and with the help of abdominal sonography. Postoperatively specimens were sent for histopathology; results were noted, and diagnostic accuracy was recorded. SPSS version 22 was used to analyze the data.

RESULTS: The age range was 20 to 50 years with a mean of 33.892±7.36 years, mean duration of complaint was 3.161±1.16 days, and mean weight was 79.402±8.42 Kg. The majority of patients were males (68.4%). Ripasa score > 7.5 diagnosed 78(16.1%) and 83(17.1%) confirmed by histopathology. Ripasa score > 7.5 had 83.1% sensitivity, 97.8% specificity and diagnostic accuracy 95%, PPV 88.46%, NPV 96.55%, Likelihood positive and negative ratio 37.04 and 0.172 respectively. Ripasa score of 6.5 had a sensitivity of 85.5% and specificity of 94.3%, as shown by the ROC curve and its coordinates.

CONCLUSION: RIPASA is a manageable and comprehensive scoring system with high sensitivity and specificity for diagnosing acute appendicitis.

KEYWORDS: Acute appendicitis, RIPASA, Diagnostic accuracy, Right Iliac fossa's pain, ROC (Receiver Operating Characteristic), Reliable score.

This article may be cited as: Magsi AM, Malik M, Khan MI. RIPASA Scores; a Reliable Score for Diagnosis of Acute Appendicitis. J Liaquat Uni Med Health Sci. 2022;21(02):97-101.
doi: 10.22442/jlumhs.2022.00914.

INTRODUCTION

The appendix is reviewed as a vestigial organ and is surgically highlighted due to its propensity for inflammation, which results in acute appendicitis[1]. Therefore, it remained the highly prevalent cause of acute abdomen and appendectomy among the standard surgical intervention worldwide. Lifetime risk in the population is about six percent, 8.6% in males and 6.7% in females[2]. Acute appendicitis was diagnosed clinically with blood tests showing raised leucocytes with a left shift. Despite being prevalent, it remained an onerous conclusion, specifically in adolescent, elderly and reproductive women, like urinary tract issues and pelvic pathology can mock acute appendicitis[3].

Furthermore, different anatomical positions of the appendix may lead to diverse and more complex clinical pictures each time[4]. A slowdown in undergoing an appendectomy to enhance its diagnostic correctness increases the probability of complications and upturns morbidity and mortality[5]. In contrast, with low diagnostic accuracy, the negative and gratuitous appendectomy rate is exacerbated (20-40%)[6]. The high price the patients and the health care facilities paid after negative appendectomies and significant post-operative issues were also reported[7]. However, the diagnostic techniques are high-priced and may not be readily obtainable when required. This may lead to a further delay for confirmation of diagnosis and eventually slowdown of surgery[8]. Many algorithms evolved to assist in diagnosing acute appendicitis. Amongst them, Alvarado and the modified Alvarado score are the customary ones.

There is limited data on this topic in our general population, and the results from past literature cannot be generalized to all people. Therefore I have planned to get more evidence on this subject in our local population by determining the effectiveness of the RIPASA score for Acute Appendicitis by picking histopathology as the benchmark. Our research will pave the way for our doctor community to consider the RIPASA score for Diagnosis of Acute Appendicitis and plan further review.

Received: ***30-09-2021***
Revised: ***18-05-2022***
Accepted: ***19-05-2022***

METHODOLOGY

This Cross-Sectional Study was conducted in General Surgery Unit, Jinnah Postgraduate Medical Centre Karachi, from May 2017 to February 2018. WHO sample size calculator used for calculation: Sensitivity = 88.46%, Specificity = 66.67%, Prevalence = 6%, Precision level for sensitivity=12%, Precision level for specificity=12% and sample size (n) =484. Data was collected by Non-probability consecutive sampling, including patients between 12-50 years of age, of both genders, lower abdominal migratory pain to the right iliac fossa of < 7 days, fever ≥101°F, and WBC >10000mm^3. Patients with ASA scores III-VI, gangrenous appendicitis, peritonitis, and pregnant women were excluded. Approval from the ethical review committee of the institute was taken, and informed consent was obtained. Basic demographics like age, duration of complaint, and weight were noted. RIPASA score was assessed for all patients. The trainee fellow noted the scorecard component on the presentation, which was not used for the management plangate, was summed up later on. More than a 7.5 score was contemplated significant. The conclusion of appendicitis was prepared clinically, and a pelvis ultrasound was also used. After appendectomies, specimens were sent for histopathological Evaluation. The histopathology and RIPASA score were noted, and diagnostic accuracy was recorded per the operational definition in the especially designed proforma. IBM-SPSS V.22 was used for DATA entry and analysis. For qualitative variables, frequency and percentage, whereas mean ± standard deviation was calculated for quantitative variables. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic precision for RIPASA score contradicting histopathology were calculated using the 2X2 model. ROC (Receiver Operating Characteristic) and likelihood ratio was also calculated.

Stratification is used for effect modifiers like age, gender, weight, and complaint duration. Post-stratification using diagnostic accuracy was calculated, and p ≤0.05 was measured as statistically noteworthy.

RESULTS

In between 20 to 50 years age group, with a mean of 33.892±7.36 years, the mean duration of complaints was 3.161±1.16 days, and the mean weight was 79.402±8.42 Kg. The majority of patients were males, i.e., 68.4%.

Ripasa score > 7.5 diagnosed 78(16.1%), and histopathology diagnosed 83(17.1%) patients having appendicitis.

Ripasa score > 7.5 had shown a sensitivity of 83.1%, specificity of 97.8%, the diagnostic accuracy of 95%, PPV 88.46%, NPV 96.55%, Likelihood positive ratio of 37.04. In contrast, the negative ratio was 0.172 in detecting appendicitis **Table I.**

A cut-off level of Ripasa scores of 6.5 had shown a sensitivity of 85.5% and specificity of 94.3%, as shown by ROC (Receiver Operating Characteristic) curve and its coordinates as shown in Graph-I.

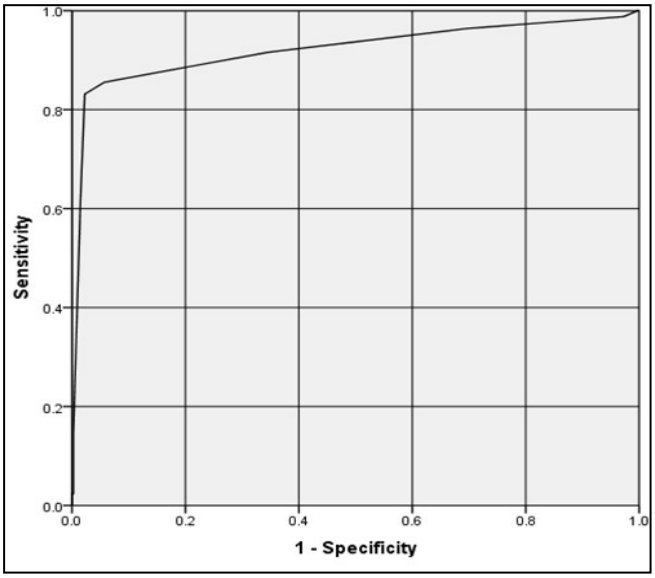
Stratification concerning the duration of complaints of Ripasa score > 7.5 versus histopathology is shown in **Table IIa & IIb,** respectively.

TABLE I: RIPASA SCORE VERSUS HISTOPATHOLOGY FOR ACUTE APPENDICITIS

Ripasa Score	Histopathology		Total
	Positive	Negative	
Positive	69 (TP)	9 (FP)	78
Negative	14 (FN)	392 (TN)	406
Total	**83**	**401**	**484**

Chi square = 332.82
P value = 0.000

GRAPH I: ROC CURVE



Sensitivity: *83.1%*
Specificity*: 97.8%*
Diagnostic Accuracy: *95%*
PPV: *88.46%*
NPV: *96.55%*
Likelihood Ratio positive = *37.04*
Likelihood Ratio negative = *0.172*

COORDINATES OF THE CURVE

Ripasa Score	Sensitivity	1 – Specificity
1.0000	1.000	1.000
2.5000	1.000	.998
3.5000	.988	.973
4.5000	.964	.696

5.5000	.916	.344
6.5000	.855	.057
7.5000	.831	.022
8.5000	.614	.015
9.5000	.145	.002
10.5000	.108	.002
11.5000	.024	.002
12.5000	.024	.000
13.5000	.012	.000

TABLE IIa: STRATIFICATION CONCERNING THE DURATION OF COMPLAINTS (1-3 DAYS) OF RIPASA SCORE VERSUS HISTOPATHOLOGY (n=313)

Ripasa score	Histopathology		Total	P-value
	Positive	Negative		
Positive	54 (TP)	56 (FP)	110	0.833
Negative	259 (FN)	257 (TN)	516	
Total	**313**	**313**	**626**	

Sensitivity: *17.3%*
Specificity: *82.1%*
DA=*50%*
PPV=*49.6%*
NPV=*49.8%*
LR+= *0.96*
LR-=*1.00*

TABLE-IIb: STRATIFICATION CONCERNING THE DURATION OF COMPLAINTS (4-6 DAYS) OF RIPASA SCORE VERSUS HISTOPATHOLOGY (n=171)

Ripasa score	Histopathology		Total	P-value
	Positive	Negative		
Positive	24 (TP)	27 (FP)	51	0.648
Negative	147 (FN)	144 (TN)	291	
Total	**171**	**171**	**342**	

Key:
Sensitivity: *14%*
Specificity: *84.2%*
DA=*49%*
PPV=*47.05%*
NPV=*49.4%*
LR+= *0.88*
LR-=*1.02*

DISCUSSION

Acute appendicitis is the most frequent cause of acute abdomen and has a lifetime threat of about seven percent. The symptoms overlap and mimic many other illnesses, making diagnosis more difficult, especially in the initial stage. If admission takes place, specific imaging is needed before moving for an appendectomy[9]. Exceptional imaging like CT scan has significant sensitivity (94%) and specificity (95%) for displaying appendicitis[10]. Carrying out imaging (CT scan) is usual in tertiary setups especially suspecting appendicitis in the elderly[11]. Although such execution can be excessive and overstretched, it thus far encumbered the national healthcare system.

On top of that, requesting a CT scan further delays emergency appendectomy. Recent literature documented that the promiscuous use of CT scans can pick up early appendicitis. These patients may then be put through a superfluous appendectomy, in a condition that can be treated with antibiotics therapy[12]. Algorithms like Alvarado and its Modified version succor clinicians' in establishing a diagnosis in an agile and economical way; they can also recommend surgeons for an emergency appendectomy or conservative management[13,14]. The "Raja Isteri Pengiran Anak Saleha Appendicitis" (RIPASA) score is a straightforward calculation of fourteen variables (two demographics, five clinical symptoms, five clinical signs, and two clinical investigations) and one supplementary variable (foreign ID). The RIPASA score manifested 88.46% sensitivity, 66.67% specificity, and diagnostic accuracy of 81%[15, 16].

RIPASA score was commenced due to low sensitivity (53-88%) and specificity (75-80%) of Alvarado and the Modified Alvarado[17].

In one of the studies, the RIPASA score appropriately categorized ninety-seven percent of patients with histology-proven acute appendicitis to the highly suspected group (>7.5) and eighty-one percent of negative appendicitis with less suspicion group (<7.5). A small percent of 9.7 patients were in the indeterminate group, in whom abdominal ultrasound was needed[17]. These outcomes outperform the Alvarado and the Modified Alvarado scoring system when applied to a comparable population[18-21]. 'Appendicitis inflammatory response score' by Anderson et al. in 2008, with a sensitivity of ninety-six percent and a specificity of seventy-three percent if the score is >4 or sensitivity of 37% and specificity of 99% at >8 score[22, 23]. In the Appendicitis inflammatory response score, a significant number of thirty-seven percent were in the indeterminate group, compared with 9.7% for the RIPASA score ($p<0.0001$)[22, 23]. Furthermore, the RIPASA score's sensitivity and specificity are comparable to those attained with specialized imaging for appendicitis[23]. Therefore, the applicability of the RIPASA score reduces the number of radiological imaging for diagnosing appendicitis in the indeterminate group (9.7%).

A score from 7.5 and 12, especially in females, needs additional imaging, such as pelvis U/S to omit pelvic pathologies because of the high prevalence of females in the false-positive group (75%) [24, 25]. The

RIPASA score is a straightforward and undemanding scoring system amongst 14 clinical parameters; many of them can be retrieved from a decent history and examination. Including a urine dip that can be effortlessly executed. Therefore, a swift method and a quick diagnosis can be made with a score of >7.5. It has an additional and rare parameter of overseas nationality. Even though the RIPASA score was explicitly for residents, the fourteen clinical parameters can apply to all populations. The other parameter of foreign NRIC can be counted for nations with considerable overseas workers. In short, the RIPASA score is an uncomplicated scoring system comprising fourteen clinical parameters estimated from well-taken history and well-performed clinical exam, with significant sensitivity and specificity for diagnosing acute appendicitis[26]. RIPASA Score Management guidelines, showing a score of <5.0 in that case probability of acute appendicitis is doubtful, the patient needs observation and then revise the score after an hour or proceed for imaging, if decreasing score, can send home and follow up in the outpatient department. In contrast, managing as per score if it's raised, a score of 7.5-11.5 has high suspicion and needs a review of the on-duty surgeon, also repeat score in 1 to 2 hours. Subsequently, it remained high and required surgical intervention, but women underwent pelvis ultrasound to exclude any gynecological issues. A score of >12 can be suspected as definitive appendicitis, referring to a surgeon for appendectomy, keeping NPO and appropriate antibiotic.

CONCLUSION

RIPASA is a straightforward and effortless method with favorable sensitivity and specificity for diagnosing appendicitis. Balanced patient history and examination will be able to assess all the 14 clinical parameters. Therefore quick conclusion on the management can be constructed. Even though this score came about for our indigenous population, but can be applied to all regions.

Ethical permission: Jinnah Postgraduate Medical Center Karachi ERC letter No. F.2-81 2018 – GENL/03946/JPMC, dated 06-05-2017.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: There was no funding agency used for this research.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Magsi AM: Conception, Study design
Malik M: Manuscript drafting, data analysis
Khan MI: Literature review and final review of manuscript

REFERENCE

1. Khadda S, Yadav AK, Ali A, Parmar A, Sakrani JK, Beniwal H. Clinical study to evaluate the RIPASA scoring system in the diagnosis of acute appendicitis. Am J Adv Med Surg Res. 2015; 1(2): 67-73.
2. Snyder MJ, Guthrie M, Cagle S. Acute Appendicitis: Efficient Diagnosis and Management. Am Fam Physician. 2018; 98(1): 25-33.
3. Esam Amer (April 26th 2021). Mimickers of Acute Appendicitis [Online First], IntechOpen, doi: 10.5772/intechopen.96351. Available from: https://www.intechopen.com/online-first/75380.
4. Monsonis B, Mandoul C, Millet I, Taourel P. Imaging of appendicitis: Tips and tricks. Eur J Radiol. 2020; 130: 109165. doi: 10.1016/j.ejrad.2020.109165.
5. Podda M, Gerardi C, Cillara N, Fearhead N, Gomes CA, Birindelli A, et al. Antibiotic Treatment and Appendectomy for Uncomplicated Acute Appendicitis in Adults and Children: A Systematic Review and Meta-analysis. Ann Surg. 2019; 270 (6): 1028-40. doi: 10.1097/SLA.0000000000003225.
6. De Simone B, Chouillard E, Borzellino G. Diagnostic Imaging in Surgery. In: Piscioneri F, Kluger Y, Ansaloni L. (eds) Emergency Surgery for Low Resource Regions. Hot Topics in Acute Care Surgery and Trauma. 2021; Springer, Cham. https://doi.org/10.1007/978-3-030-68099-2_6.
7. Tamini N, Santurro L, Chiappetta MF, Gattuso I, Barbieri C, Fattori L et al. Morbidity after negative appendectomy: a single-centre experience on 627 cases. Eur J Trauma Emerg Surg. 2020; 46(4): 859-864. doi: 10.1007/s00068-019-01138-w.
8. Butt MQ, Chatha SS, Ghumman AQ, Farooq M. RIPASA score: a new diagnostic score for diagnosis of acute appendicitis. J Coll Physicians Surgeon Pak. 2014; 24(12): 894-7.
9. Smith MP, Katz DS, Lalani T, Carussi L, Cash B, Kim D et al. ACR Appropriateness Criteria right lower quadrant pain-suspected appendicitis. Ultrasound Q. 2015; 31(2): 85-91. doi: 10.1097/RUQ.0000000000000118.
10. Sippola S, Virtanen J, Tammilehto V, Grönroos J, Hurme S, Niiniviita H et al. The Accuracy of Low-dose Computed Tomography Protocol in Patients With Suspected Acute Appendicitis: The OPTICAP Study. Ann Surg. 2020; 271(2): 332-338. doi: 10.1097/SLA.0000000000002976.
11. Fugazzola P, Ceresoli M, Agnoletti V, Agresta F, Amato B, Carcoforo P et al . The SIFIPAC/WSES/SICG/SIMEU guidelines for diagnosis and treatment of acute appendicitis in the elderly (2019 edition). World J Emerg Surg. 2020; 15: 19. doi: 10.1186/s13017-020-00298-0.
12. Livingston EH, Woodward WA, Sarosi GA, Haley RW. Disconnect between incidence of non-

perforated and perforated appendicitis: implications for pathophysiology and management. Ann Surg. 2007; 245(6): 886-92.
13. Korkut M, Bedel C, Karancı Y, Avcı A, Duyan M. Accuracy of Alvarado, Eskelinen, Ohmann, RIPASA and Tzanakis Scores in Diagnosis of Acute Appendicitis; a Cross-sectional Study. Arch Acad Emerg Med. 2020; 8(1): e20.
14. Kalan M, Talbot D, Cunliffe WJ, Rich AJ. Evaluation of the modified Alvarado score in the diagnosis of acute appendicitis: a prospective study. Ann R Col Surg Engl. 1994; 76(6): 418-9.
15. Chong CF, Adi MI, Thien A, Suyoi A, Mackie AJ, Tin AS et al. Development of the RIPASA score, a new appendicitis scoring system for the diagnosis of acute appendicitis. Singapore Med J. 2010; 51 (3): 220-5.
16. Pachya U, Shrestha SR, Pokharel YR, Thapa A. A Comparative Study of Raja Isteri Pengiran Anak Saleha and Alvarado Scores to Diagnose Acute Appendicitis. J Nepal Health Res Counc. 2021; 19 (1): 111-4. doi: 10.33314/jnhrc.v19i1.1435.
17. Anilkumar S, Anilkumar AV, Shijina K, Govinda U. Diagnostic efficacy of Ripasa scoring in acute appendicitis: a tertiary care center study. J Med Sci Clin Res. 2017; 5(1): 17126-30.
18. Al-Hashemy AM, Saleem MI. Appraisal of the modified Alvarado Score for acute appendicitis in adults. Saudi Med J. 2004; 25(9): 1229-31.
19. Shuaib A, Shuaib A, Fakhra Z, Marafi B, Alsharaf K, Behbehani A. Evaluation of modified Alvarado scoring system and RIPASA scoring system as diagnostic tools of acute appendicitis. World J Emerg Med. 2017; 8(4): 276-280. doi: 10.5847/wjem.j.1920-8642.2017.04.005.
20. Khan I, Rehman AU. Application of Alvarado scoring system in diagnosis of acute appendicitis. J Ayub Med Col Abbottabad. 2005; 17(3): 41-4.
21. Jang SO, Kim BS, Moon DJ. Application of Alvarado score in patients with suspected appendicitis. Korean J Gastroenterol. 2008; 52(1): 27-31.
22. Anderson M, Anderson RE. The appendicitis inflammatory response score: a tool for the diagnosis of acute appendicitis that outperforms the Alvarado score. World J Surg. 2008; 32(8): 1843-9. doi: 10.1007/s00268-008-9649-y.
23. Patil S, Harwal R, Harwal S, Kamthane S. Appendicitis inflammatory response score: a novel scoring system for acute appendicitis. Int Surg J. 2017; 4(3): 1065-70.
24. Sharma P, Hegde R, Kulkarni A, Soin P, Kochar P, Rotem E. Imaging right lower quadrant pain: Not always appendicitis. Clin Imaging. 2020 Jul;63:65-82. doi: 10.1016/j.clinimag.2020.02.012.
25. Expert Panel of Gastrointestinal Imaging, Scheirey CD, Fowler KJ, Therrien JA, Kim DH, Al-Refaie WB, et al. ACR Appropriateness Criteria® Acute Nonlocalized Abdominal Pain. J Am Coll Radiol. 2018; 15(11S): S217-S231. doi: 10.1016/j.jacr.2018.09.010.
26. Khattak IA, Mabood W, Naeem M, Ali S, Khattak MA. RIPASA Score; Its Sensitivity, Specificity in Diagnosing Suspected Acute Appendicitis. J Saidu Med Coll Swat. 2021; 11(3): 151-5. doi.org/10.52206/jsmc.2021.11.3.650.

AUTHOR AFFILIATION:

Dr. Abdul Malik Mangi
Registrar, Department of Surgery
Jinnah Postgraduate Medical Center
(JPMC), Karachi, Sindh-Pakistan.

Dr. Mariam Malik *(Corresponding Author)*
Registrar, Department of Surgery
JPMC, Karachi, Sindh-Pakistan.
Email: malikmariam_15@hotmail.com

Dr. Mohammad Iqbal Khan
Professor, Department of Surgery
JPMC, Karachi, Sindh-Pakistan.

Original Article

Frequency of C4d Positivity in Membranous and other Glomerulonephritis in Renal Biopsy Specimens in a Tertiary Care Hospital

Maria Shafique, Uzma Bukhari, Suresh Kumar, Muhammad Raza, Asma Bukhari

ABSTRACT

OBJECTIVE: To determine the frequency of C4d positivity in Membranous and other Glomerulonephritis in renal biopsy specimens.

METHODOLOGY: This cross-sectional study was carried out in the Pathology Department, Ziauddin Medical University and Hospital, Karachi, from December 2018 to April 2019. Non-probability consecutive sampling technique was used.. A sample size of 91 patients was calculated and selected by open EPI software with a 95% confidence interval. All patients of either gender with a clinical history of Glomerulonephritis were included. The diagnosis was made on sections stained with hematoxylin and eosin (H&E) along with special stains. Immunohistochemistry was performed on selected biopsies with glomerular basement thickness using the peroxidase-anti peroxidase technique for C4d. Patient data were compiled and analyzed through a statistical package for the Social Sciences (SPSS) Version 20.0. P -value ≤0.05 was considered significant.

RESULTS: A total of 91 cases of the renal biopsy were evaluated. There were 51.6% (47/91) were male, and 48.4% (44/91) were female patients. There were 49 (53.8%) cases reported as Focal segmental glomerulosclerosis, 35(38.5%) were diagnosed as Membranous Glomerulonephritis, and 07 (7.7%) cases were reported as Mesangiocapillary Glomerulonephritis.

The frequency distribution of C4d staining results in Membranous Glomerulonephritis was 100% (35/91), Mesangiocapillary glomerulonephritis 100% (7/91), and Focal segmental glomerulosclerosis was 0% (0/91).

CONCLUSION: C4d positivity on immunohistochemistry (IHC) can be an important marker for diagnosing membranous nephropathy.

KEY WORDS: Glomerulonephritis, Immunofluorescence, immunohistochemistry C4d Positivity.

This article may be cited as: Shafique M, Bukhari U, Kumar S, Raza M, Bukhari A. Frequency of C4d Positivity in Membranous and other Glomerulonephritis in Renal Biopsy Specimens in a Tertiary Care Hospital. J Liaquat Uni Med Health Sci. 2022;21(02):102-6. doi: 10.22442/jlumhs.2022.00910. Epub 2022 May 18.

INTRODUCTION

Glomerular diseases are a public health concern throughout the world. According to the World Health Statistics and Sustainable Development Goals (SDG) project, diseases in the renal and urinary system account for a great deal of the global burden of diseases, with an estimated eight hundred and fifty thousand annual deaths and over fifteen million disability-adjusted life years [1].

Membranous Glomerulonephritis is the general cause of the adult nephrotic syndrome. Approximately 25% of renal biopsies were performed for this syndrome. The diagnosis is established with the patient's presenting signs and symptoms and findings on H&E staining showing thickening of the glomerular capillary wall. However, cases of early membranous may not show apparent thickening and spikes[2].

Received: ***25-08-2021***
Revised: ***09-05-2022***
Accepted: ***11-05-2022***
Published Online: ***18-05-2022***

Thus, immunofluorescence (IF) examination is necessary, showing immunoglobulin G (IgG) and or C3 with granular staining. In biopsies, which have subtle spikes or / no spikes on methenamine silver stain or no glomeruli on Immunofluorescence, C4d positivity on immunohistochemistry (IHC) played a valuable tool in established diagnosis as membranous nephropathy in multiple international studies[3,4].

The vital role of immunohistochemistry (IHC) in appreciating C4d immunological consequences in renal pathology is considerable. Its staining is not expensive and can be efficiently performed in laboratories with uncomplicated results analysis. Multiple authors have compared IF and IHC in renal diseases by giving specific attention to the specificity and sensitivity[5,6]. It has been concluded that the pattern and intensity analysis between IF and IHC are commensurate.

There are limited compositions present in the use of C4d for Glomerulonephritis. Furthermore, no local study on its results in membranous and other

Glomerulonephritis has been done. Therefore, the current research will highlight the role of C4d in membranous and other Glomerulonephritis.

METHODOLOGY

Our cross-sectional study was conducted in the Department of Pathology, Dr Ziauddin Medical University and Hospital, Karachi. Sample collection was carried out from December 2018 to April 2019. Non-probability consecutive sampling technique was used for the study. A sample size of 91 patients with Glomerulonephritis was calculated and selected by openEPI software with a 95% confidence interval and margin of error of 4.5%, with a prevalence of C4d positivity of 95%.

All patients of either gender with a clinical history of Glomerulonephritis with presenting symptoms of nephrotic or nephritic syndrome, e.g., hematuria, proteinuria, hypertension, edema, were included in the study. Patients with no clinical history of glomerulonephritis and transplant biopsies were omitted. Informed consent from the patient was taken. The diagnosis was made on formalin-fixed and paraffin-embedded tissue sections stained with hematoxylin and eosin (H&E) and special stains, including periodic acid Schiff (PAS) trichrome methenamine silver. Biopsies with an optimal number of glomeruli (10-11) counted on H&E stains were noted. Immunohistochemistry (IHC) was performed on selected biopsies with glomerular basement membrane thickness using the peroxidase-anti peroxidase technique for C4d.

Patient data were compiled and analyzed through a statistical package for the Social Sciences (SPSS) Version 20.0. Mean±SD were calculated for quantitative variable, i.e., a number of glomeruli. The stratification was done on the number of glomeruli to see the effect of these modifiers on outcomes. After stratification, the Chi-square test was used to assess significance, and P-value ≤0.05 was considered significant.

RESULTS

A total of 91 cases of renal biopsy were evaluated. There were 51.6% (47/91) were male, and 48.4% (44/91) were female patients. The overall mean age of patients was 30.71±14.99 years. There were 49 (53.8%) cases reported as Focal segmental glomerulosclerosis (Figure I), 35(38.5%) cases were diagnosed as Membranous Glomerulonephritis (Figure II, III), and 07 (7.7%) cases were reported as Mesangiocapillary Glomerulonephritis. Out of 35 cases of Membranous Glomerulonephritis, seven were reported as pre-spike Membranous Glomerulonephritis on H&E stain. Diffuse GBM thickening with spikes has been seen in 32 cases on silver stains.

Descriptive statistics of focal segmental glomerulosclerosis, membranous Glomerulonephritis and mesangiocapillary Glomerulonephritis according to gender, age group and glomeruli number are presented in the Tables I, II and III, respectively.

The frequency distribution of C4d staining results according to membranous Glomerulonephritis was 100% (35/91) (Figure IV), mesangiocapillary glomerulonephritis 100% (7/91), and focal segmental glomerulosclerosis 0% (0/91). The mean number of glomeruli positive on C4d staining was 19.82±11.31 Frequency of C4d staining results according to gender, age group and glomeruli number is presented in Table IV.

FIGURE I: PAS STAIN SHOWS FOCAL SEGMENTAL GLOMERULOSCLEROSIS

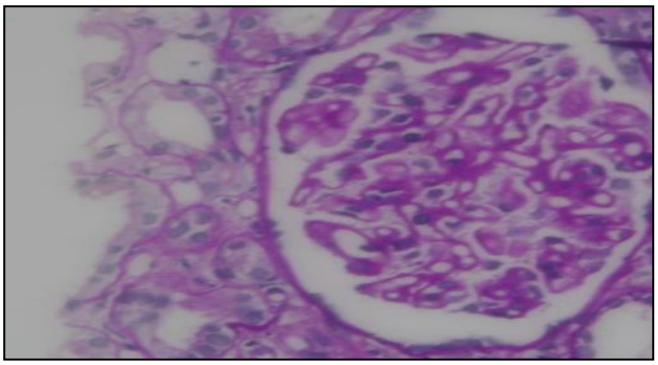


FIGURE II: SILVER STAIN SHOWS MEMBRANOUS GLOMERULONEPHRITIS

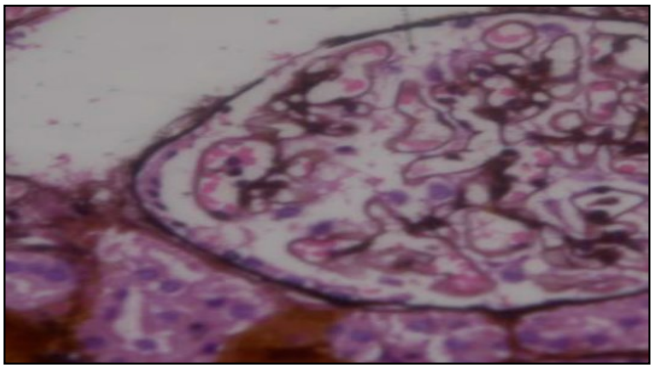


FIGURE III: IMMUNOFLUORESCENCE SHOWS POSITIVE IGG IN MEMBRANOUS GLOMERULONEPHRITIS

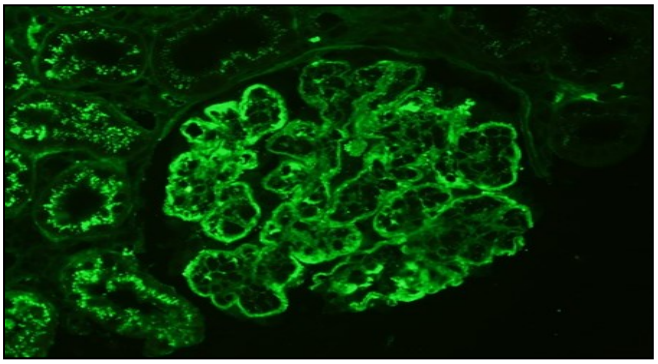


TABLE I: FREQUENCY OF FOCAL SEGMENTAL GLOMERULOSCLEROSIS ACCORDING TO GENDER, AGE GROUP AND GLOMERULI NUMBER (n=91)

		Total	Focal Segmental Glomerulosclerosis		P-Value
			Yes (n=49)	No (n=42)	
Gender	Male	**47**	29(61.7)	18(38.3)	0.120
	Female	**44**	20(45.5)	24(54.5)	
Age Group	≤18 years	**24**	13(54.2)	11(45.8)	0.671
	>18 years	**47**	36(53.7)	31(46.3)	
Glomeruli number	≤25	**44**	22(50)	22(50)	0.476
	>25	**47**	27(57.4)	20(42.6)	

TABLE II: FREQUENCY OF MEMBRANOUS GLOMERULONEPHRITIS ACCORDING TO GENDER, AGE GROUP AND GLOMERULI NUMBER (n=91)

		Total	Membranous Glomerulonephritis		P-Value
			Yes (n=35)	No (n=56)	
Gender	Male	**47**	15(31.9)	32(68.1)	0.185
	Female	**44**	20(45.5)	24(54.5)	
Age Group	≤18 years	**24**	9(37.5)	15(62.5)	0.910
	>18 years	**67**	26(38.8)	41(61.2)	
Glomeruli number	≤25	**44**	21(47.7)	23(52.3)	0.079
	>25	**47**	14(29.8)	33(70.2)	

TABLE III: FREQUENCY OF MESANGIOCAPILLARY GLOMERULONEPHRITIS ACCORDING TO GENDER, AGE GROUP AND GLOMERULI NUMBER (n=91)

		Total	Mesangiocapillary Glomerulonephritis		P-Value
			Yes (n=7)	No (n=84)	
Gender	Male	**47**	3(6.4)	44(93.6)	0.628
	Female	**44**	4(9.1)	40(90.9)	
Age Group	≤18 years	**24**	2(8.3)	22(91.7)	0.891
	>18 years	**67**	5(7.5)	62(92.5)	
Glomeruli number	≤25	**44**	1(2.3)	43(97.7)	0.060
	>25	**47**	6(12.8)	41(87.2)	

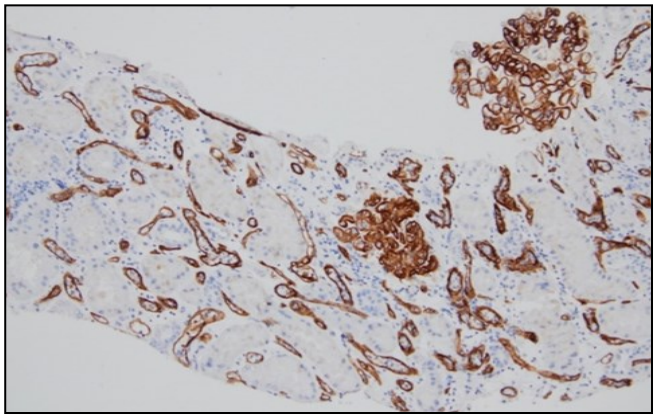
DISCUSSION

The glomerular disease rate is variable in various populations with unique genetic and demographic characteristics[7]. Chronic kidney disease is 12.5% common in Karachi. While detailing the incidence of CKD in Pakistan as 64%[8]. Furthermore, the findings from a study conducted in Karachi suggest that the glomerular filtration rate was reduced to some degree in nearly a quarter of all screened individuals. In most renal dysfunction cases (81.06%), the underlying pathology is glomerular dysfunction/disease[9].

TABLE IV: FREQUENCY OF C4d STAINING RESULTS ACCORDING TO GENDER, AGE GROUP AND GLOMERULI NUMBER (n=91)

		Total	C4d Staining Result		P-Value
			Yes (n=35)	No (n=56)	
Gender	Male	47	15(31.9)	32(68.1)	0.185
	Female	44	20(45.5)	24(54.5)	
Age Group	≤ 18 years	24	9(37.5)	15(62.5)	0.910
	≥18 years	67	26(38.8)	41(61.2)	
Glomeruli Number	≤ 25	44	21(47.7)	23(52.3)	0.079
	≥ 25	47	14(29.8)	33(70.3)	

FIGURE IV:
IMMUNOHISTOCHEMICAL SATIN C4D POSITIVE IN MEMBRANOUS GLOMERULONEPHRITIS



Immunohistochemistry utilization to appreciate the C4d immune-related outcome in kidney disease has beneficial interest on clinical grounds. Currently, the importance of C4d has been established in the pathology and diagnosis of renal biopsies; however, there are fewer publications available. A study in Japan[5] has highlighted the benefits of C4d in Glomerulonephritis compared to Immunofluorescence. Regional data showed focal segmental glomerulosclerosis (FSGS) as the leading histopathological diagnosis among all primary Glomerulonephritis was 29% conducted in Pakistan[10], followed by Membranous Glomerulonephritis seen in 23.5% of cases. In our study, primary focal segmental glomerulosclerosis was 53.8% (49/91), the most common histological diagnosis, followed by Membranous Glomerulonephritis 38.5% (35/91). Our

findings confirm the findings of multiple local studies[11,12] and international studies[13,14]. In all cases of focal segmental glomerulosclerosis, 100% (49/91) were negative for C4d staining. Our findings are comparable with Torbati and Tavakolian[15], who reported similar results as all 14 cases (100%) in their study were negative for C4d.

In the current study, in 91 cases of renal biopsies, 46.1% (42/91) showed positivity for C4d staining in the capillary glomeruli wall. A study by Espinosa et al.[16], reported the frequency of Membranous nephropathy as 52.5% with C4d positivity in 100% of cases, similar to what is observed by the current study showing C4d positivity in 100% of cases of this entity.

A study from the United States of America[17] showed C4d positivity in all 0.2% (34/165) cases of Pre-spike Membranous Glomerulonephritis. In our study, 7.7% (7/91) cases were Pre-spike Membranous Glomerulonephritis, and all showed positivity for C4d staining, similar to the study conducted in the United States of America. Identical results are also reported in a study from Tehran, Iran[15], with 100% positivity of C4d in membranous Glomerulonephritis.

In the current study, cases of mesangiocapillary Glomerulonephritis were 7.7% (7/91), all of which showed positivity for C4d staining in the Capillary Glomeruli wall. A study conducted by Gupta et al. [18] showed a 53.57% frequency of mesangiocapillary Glomerulonephritis, which is very high compared to our research, most likely due to the small sample size. A study by Drachenberg CB et al.[19] reported 22 cases of mesangiocapillary Glomerulonephritis in 519 cases. All cases were positive for C4d, which agrees with the findings of our study. However, study from Iran[15] showed only 02 cases of mesangiocapillary Glomerulonephritis; both were negative for C4d, which could be due to a smaller number of this entity.

CONCLUSION

In conclusion, C4d staining can be used in Membranous Glomerulonephritis, especially in Pre-spike Membranous Glomerulonephritis when the Immunofluorescence of IgG staining is very weak or focal. C4d staining is a well-founded procedure to demonstrate the diagnosis of membranous Glomerulonephritis in kidney biopsy specimens.

The current study showed few hindrances. One of them is the smaller scale sample size, and hence more structured studies with a larger sample are required. This study was conducted in an urban area; therefore, the results might not generalize to larger populations.

Ethical Permission: College of Physicians and Surgeons Pakistan dissertation approval letter No. CPSP/REU/ HSP.2015-201-565, Dated: 23-12-2019.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: There was no funding agency used for this research.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Shafique M: Primary investigator
Bukhari U: Manuscript review and final approval
Kumar S: Data interpretation
Raza M: Drafting and writing of the manuscript
Bukhari A: Review & editing

REFERENCES

1. Li H, Lu W, Wang A, Jiang, H, Lyu J. Changing epidemiology of chronic kidney disease as a result of type 2 diabetes mellitus from 1990 to 2017: estimates from Global Burden of Disease 2017. J Diabetes Investig. 2021; 12(3): 346-348. doi: 10.1111/jdi.13355.
2. Mills SE, Greenson JK, Hornick JL, Longacre TA, Reuter VE. Sternberg's diagnostic surgical pathology: Sixth edition. Wolters Kluwer Health Adis. 2015; 190.
3. Yadav S, Singhai A, Babu S, Singh VJ, Wakhlu A, Sonkar S et al. Utility of C4D deposits in native renal diseases and relation with disease progression. Indian J Health Sci Biomed Res. 2019; 12(1): 50-55. doi: 10.4103/ kleuhsj.kleuhsj_156_18.
4. Filinte D, Arıkan H, Koç M, Kaya H, Özener IC, Akbaş G. The Intensity of PLA2R and C4d Immuno expression in Primary Membranous Nephropathy. South Clin Ist Euras. 2020; 31(2): 101-106.
5. Suzuki T, Horita S, Kadoya K, Mitsuiki K, Aita K, Harada A et al. C4d immunohistochemistry in Glomerulonephritis with different antibodies. Clin Exp Nephrol. 2007; 11(4): 287-91. doi: 10.1007/ s10157-007-0496-1.
6. Mölne J, Breimer ME, Svalander CT. Immunoperoxidase versus Immunofluorescence in the assessment of human renal biopsies. Am J Kidney Dis. 2005; 45(4): 674–83. doi: 10.1053/ j.ajkd.2004.12.019.
7. Yang, Y, Zhang Z, Zhuo L, Chen DP, Li WG. The spectrum of biopsy-proven glomerular disease in China: a systematic review. Chin Med J(Engl). 2018; 131(6): 731-735. doi: 10.4103/0366-6999.226906.
8. Rehman IU, Khan TM. Epidemiology of chronic kidney diseases (CKD) in Malaysia and Pakistan, pathophysiology of CKD-associated pruritus and other CKD-associated dermatological disorders. Progress Microbes Molecul Biol. 2020; 3(1): 103-104.
9. Imtiaz S, Salman B, Qureshi R, Drohlia MF, Ahmad A. A review of the epidemiology of chronic

kidney disease in Pakistan: A global and regional perspective. Saudi J Kidney Dis Transpl. 2018; 29 (6): 1441-541. doi: 10.4103/1319-2442.248307.
10. Val-Bernal JF, Garijo MF, Val D, Rodrigo E, Arias M. C4d immunohistochemical staining is a sensitive method to confirm immunoreactant deposition in formalin-fixed paraffin-embedded tissue in Membranous Glomerulonephritis. Histol Histopathol. 2011; 26(11): 1391-7. doi: 10.14670/HH-26.1391.
11. Asif N, Ahsan MN, Khanzada SW. Spectrum of Renal Parenchymal Diseases: An Eleven Year Retrospective Review of Renal Biopsy Data from a Tertiary Care Hospital in Pakistan. Ann King Edward Med Univ. 2017; 23(1): 23-25. doi: 10.21649/akemu.v23i1.1492.
12. Hashmi AA, Hussain Z, Edhi MM, Mumtaz S, Faridi N, Khan M. Insight to changing morphologic patterns of glomerulopathy in adult Pakistani patients: an institutional perspective. BMC Res Notes. 2016; 9: 73. doi: 10.1186/s13104-016-1876-y.
13. Hamilton P, Wilson F, Chinnadurai R, Sinha S, Singh M, Ponnusamy A et al. The investigative burden of membranous nephropathy in the UK. Clin Kidney J. 2020; 13(1): 27-34. doi: 10.1093/ckj/sfz036.
14. Hu R, Quan S, Wang Y, Zhou Y, Zhang Y, Liu L et al. Spectrum of biopsy proven renal diseases in Central China: a 10-year retrospective study based on 34,630 cases. Sci Rep. 2020; 10(1): 10994.
15. Torbati PM, Tavakolian H. Diagnostic Accuracy of C4d-IHC in Diagnosis of Membranous Glomerulonephritis. Iran J Kidney Dis. 2020; 14 (1): 20-5.
16. Espinosa-Hernandez M, Ortega-Salas R, Lopez-Andreu M, Gomez Carrasco JM, Perez-Saez MJ, Perez-Seoane C et al. C4d as a diagnostic tool in Membranous nephropathy. Nefrologia. 2012; 32 (3): 295–99. doi: 10.3265/Nefrologia.pre2012.Feb. 11224.
17. Rath A, Tewari R, Mendonca S, Badwal S, Nijhawan VS. Oxford classification of IgA nephropathy and C4d deposition; correlation and its implication. J Nephropharmacol. 2016; 5(2): 75-79.
18. Gupta N, Wakefield DN, Clapp WL, Garin EH. Use of C4d as a diagnostic tool to classify membranoproliferative Glomerulonephritis. Nefrologia. 2017; 37(1): 78-86. doi: 10.1016/j.nefro.2016.05.011.
19. Drachenberg CB, Papadimitriou JC, Chandra P, Haririan A, Mendley S, Weir MR et al. Epidemiology and Pathophysiology of Glomerular C4d Staining in Native Kidney Biopsies. Kidney Int Rep. 2019; 4(11): 1555–1567. doi: 10.1016/j.ekir.2019.07.015.

AUTHOR AFFILIATION:

Dr. Maria Shafique
Research Associate
Ziauddin Medical University and Hospital
Karachi, Sindh-Pakistan.

Dr. Uzma Bukhari *(Corresponding Author)*
Professor, Department of Pathology
Dow International Medical College. Ojha Campus
Dow University of Health Sciences
Karachi, Sindh-Pakistan.
Email: uzma.bukhari@duhs.edu.pk

Dr. Suresh Kumar
Assistant Professor
Dow University of Health Sciences
Karachi, Sindh-Pakistan.

Dr. Muhammad Raza
Assistant Professor
The Aga Khan University Hospital
Karachi, Sindh-Pakistan.

Asma Bukhari
Research Associate, Ripha International University
Islamabad-Pakistan.

Original Article

Frequency, Risk Factors, Management Options and Fetomaternal Outcome of Uterine Rupture in Pregnancy

Rubina Hafeez, Rabia Hafeez

ABSTRACT

OBJECTIVE: To analyze the frequency, risk factors, management options and fetomaternal outcome of uterine rupture in pregnancy.

METHODOLOGY: This observational cohort study was conducted at the department of obstetrics & gynaecology, Unit II Ghulam Muhammad Mahar Medical College Hospital Sukkur, from January 2018 to December 2020. All pregnant women above 24 weeks gestational age admitted with or developed uterine rupture at the hospital were included. Women with less than 24 weeks gestational age or who developed uterine rupture after vaginal birth after C-section (VBAC) in a hospital or admitted with this complication were excluded from this study. Data was collected on specially designed Performa after taking informed consent. The student's T-tests have been applied. SPSS Version 16 was used to analyze data.

RESULTS: Total number of uterine rupture cases was 32(0.6%) out of 5204 deliveries for three years. The most typical age group of patients was 26-35, about 43%, grand multiparous in (60.2%) cases. Previous Caesarean Section in 18 (56.2%) was the most commonest risk factor. Repair of the ruptured uterus was the primary management option in 22 (68.75%), followed by Caesarean Hysterectomy in 10(31.2%) cases. Maternal mortality was in 1(3.1%) patient. Perinatal mortality was 26(81.2%), and 6(18.75%) were alive babies.

CONCLUSION: This study concludes that previous cesarean section is the leading cause of rupture uterus, followed by injudicious use of oxytocin. Proper Antenatal care and training programs for healthcare providers and traditional birth attendants (TBA) are needed to prevent this severe but avoidable complication.

KEYWORDS: Rupture uterus, previous caesarean section, Hysterectomy, oxytocin, vaginal birth after C-section (VBAC).

This article may be cited as: Rubina Hafeez R, Hafeez R. Frequency, Risk Factors, Management Options and Fetomaternal Outcome of Uterine Rupture in Pregnancy. J Liaquat Uni Med Health Sci. 2022;21(02):107-10. doi: 10.22442/jlumhs.2022.00929. Epub 2022 May 24.

INTRODUCTION

Rupture uterus is a rare Obstetric emergency worldwide (0.07%)1,2. Still, it is a severe life-threatening complication with an adverse outcome[3], and it is responsible for the high incidence of morbidity and mortality of mother and fetus[4].

In the general population incidence of uterine rupture, according to the WHO review, was 5.3/10,000 birth; however, it was 5.9/10,000 births in Neither land[5,6].

Uterine rupture is the disruption of the full thickness of the uterine wall has two types complete and incomplete. A complete uterine rupture is a total disruption of the uterine wall with or without extrusion of its contents into the abdominal cavity. In contrast, in incomplete uterine rupture, there is partial disruption of the uterine wall has an intact serosa or peritoneum[7-9].

The most typical causes or risk factors for uterine rupture are grand multiparity, elder primigravida, teenage pregnancy, poor socioeconomic status, unbooking status, poor antenatal care, and labour trial in previous Caesarean Section scar, unsupervised labour, injudicious use of oxytocin[10-15].

Maternal complications of uterine rupture are Hemorrhage, bladder rupture, vesicovaginal fistula, and maternal death[16,17].

Our study aimed to analyze the frequency, risk factors, management options, and fetomaternal outcome of uterine rupture in pregnancy.

Received: ***19-11-2021***
Revised: ***06-05-2022***
Accepted: ***13-05-2022***
Published Online: ***24-05-2022***

METHODOLOGY

This observational cohort study was conducted at the department of obstetrics & gynaecology, Unit II Ghulam Muhammad Mahar Medical College Hospital Sukkur, and approved by the ERC committee from January 2018 to December 2020. After taking informed consent, all pregnant women with more than 24 weeks gestational age admitted with or developed uterine rupture in the hospital were included in this study. Women with less than 24 weeks gestational age or who developed uterine rupture after vaginal birth after C-section (VBAC) in the hospital or admitted with this complication were excluded from this study. Data were collected using the standard method on

specially designed Performa about patient's age, parity, risk factors, management options, and maternal and fetal outcome due to rupture uterus in pregnancy. The student's T-tests have been applied to all tables. The data were analyzed by using SPSS Version 16.

RESULTS

Five thousand two hundred four deliveries were conducted in GMC Hospital Sukkur from January 2018 to December 2020. Patients with ruptured uterus during pregnancy were found about 32(0.6%). In most cases, 28(87.5%) were non booked. The Age of patients with a ruptured uterus varies from 20 to 40 years majority of patients were between 26 to 35 years in 24(75%) cases. Parity ranged from 1 to 12. Grand multiparity was found in about 20(62.5%) cases. The period of gestation varies from 34 to 40 weeks of pregnancy. Most patients were 37 weeks of gestation 26(81.2%).

In 26(81.2%) cases, the typical clinical presentation was shock and abdominal pain; 6 (18.8%) patients had lower abdominal pain and were vitally stable initially because of their earlier presentation. The associated cause or risk factors in patients with rupture uterus as shown in **Table I**.

Previous caesarean section or previous uterine surgery caused the uterine rupture in 18(56.25%) cases. Rupture uterus without scar(no previous C-section) in 14(43.7%) cases. Excessive use of oxytocin was responsible for rupture uterus in 08 (25%)cases. As the previous scar was responsible for causing a uterine rupture in about 18(56.2%) of patients, out of which women with previous one lower segment C-section in about 9(50%), with previous two in 4(22.2%), patients were responsible for causing rupture uterus as Shown in **Table II**.

Regarding the site of uterine rupture, the lower segment was the most typical site of rupture in 8 (56.2%) cases, followed by lateral 6(18.75%), as shown in **Table III**.

Management options were according to age, parity and condition of patients, repair of the uterus was the primary management option done in 22(78.75%) patients. Uterine repair with tubal ligation in 16(81.2%) patients; uterine repair was alone in 6(18.75%). Caesarean Hysterectomy was performed in 10 (31.2%) patients due to complete rupture, as shown in **Table IV**. Two(6.25%) patients were found with bladder rupture. Bladder repair was done, along with a hysterectomy. Almost all patients were anaemic, varying in severity from moderate to severe anaemia required three or more blood transfusions. One (3.1%) maternal death in a patient who had a rupture following obstructed labour with sepsis. There were 26 (81.2%) stillbirths (Perinatal mortality) regarding fetal outcomes. However, only 6(18.7%) babies were alive.

TABLE I:
RISK FACTORS FOR RUPTURE OF UTERUS

Risk factor	No of Patients	Percentage
Previous Scar	18	56.2
Injudicious use of oxytocin	08	25
Obstructed Labour	04	12.5
Malpresentation / Abnormal lie	02	6.25

TABLE II: NUMBER OF PREVIOUS SCARS

Previous Scar	No of Patients	Percentage
One	09	50
Two	04	22.2
Three	03	16.6
Four	02	5.5

TABLE III: SITE OF RUPTURE UTERUS

Site of Rupture	No of Patients	Percentage
Lower Uterine Segment	18	56.2
Lateral Rupture	06	18.75
Posterior Rapture	05	15.2
Fundal Rupture	03	9.3

TABLE IV: MANAGEMENT OPTIONS

Management options	No of patients	Percentage
Uterine repair	22	68.75
With tubal ligation	16	81.2
Repair alone	06	18.75
Cesarean hysterectomy	10	31.2

DISCUSSION

The incidence of our study of uterine rupture was 0.61% which is similar to a study conducted by Islam A et al.[18] in Abbottabad. The incidence reported in other studies (0.8%) in Ghana, 0.76% in Uganda, 0.9% in Nepal, and 2.8% in Ethiopia is higher than our study[19,20], but as compared to the incidence in developed countries (0.023% to 0.086 %) which is lower than our study[21]. The incidence of rupture uterus was mainly found in unbooked cases 28(87.5%). As this institute receives a majority of referral patients from the periphery, the findings are consistent with other studies[22]. The commonest age group of patients with rupture uterus found in our study was 26 to 35 years in 24 (75%) cases, comparable to the study conducted by Aziz N 2015[23] at Isra university and other studies[24]. Grand multiparty was the commonest in our research, with about 19(59.3%) women

compared to other studies[19,23]. The gestational age of occurrence of rupture uterus ranged from 34 to 40 weeks of gestation, with the most expected gestational age of about 37 weeks in 26(81.3%) cases which has also been observed in other studies[23].

Our study's major risk factors were previous caesarean section, injudicious use of oxytocin, prolonged obstructed labour, and malpresentation like other studies[25]. The rupture uterus was found to be more in patients with a previous C. Section in about 18(56.2%), followed by injudicious use of oxytocin in 10(31.2%) and obstructed labour in 6(18.7%) which also correlated to other studies and is mainly because of caesarean section rate is rising in Pakistan[26]. Most of the factors resulted from risk factors; oxytocin was injudiciously administered by untrained birth attendants (dai handled) even in patients with classical caesarean section or more than the previous two caesarean and contracted pelvis and in grand multiparity had oxytocin administered to them[25]. Previous C-sections were found in about 10 (55.5%) patients with a ruptured uterus with a history of a previous caesarean section followed by previous two and more C-sections as in other studies[18]. Regarding the site of uterine rupture lower segment was the commonest site of rupture in 18(56.2%) cases, followed by lateral, posterior and fundal rupture as correlated to other studies[27,28], regarding management options in this study which depends upon the kind and severity of the uterine rupture, general condition of mother and parity of patients. Repair of the uterus was the commonest surgical procedure for managing a case of uterine rupture in about 22(68.75%) cases, with tubal ligation in 16(81.25%) followed by caesarean hysterectomy in 10 (31.2%) patients as correlate to other studies[23,25]. Repair bladder in two (6.25%) with hysterectomy in the ruptured uterus with bladder rupture in case of obstructed labour.

Regarding maternal complications with rupture uterus, all women were anaemic as they were already anemic during pregnancy. Due to blood loss in this complication, all women needed three or more blood transfusions, as seen in other studies[23]. Bladder rupture in two women 2(6.25%) in cases of obstructed labour. Later on, the vesicovaginal fistula was also observed study in Nigeria[25]. There was one (3.1%) maternal mortality in our study in case of prolonged obstructed labour with sepsis compared to other studies[18]. Perinatal mortality was 26 (81.2%) of the fetus were stillbirth, and 6(18.75%) were alive, which is similar to a study conducted by Sahu L 2006[29] (83%).

CONCLUSION

This study concludes that previous cesarean section is the leading cause of rupture uterus, followed by injudicious use of oxytocin. Proper Antenatal care and training programs for health care providers and traditional birth attendants are needed to prevent this severe but avoidable complication.

Ethical Permission: Ghulam Muhammad Mahar Medical College Sukkur ERC letter No. GMMMC/ ERC/129-21, dated 04-08-2017.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: There was no funding agency used for this research.
Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Hafeez R: Manuscript writing, Data collection, Analysis

Hafeez R: Data collection

REFERENCES

1. Guise JM, McDonagh MS, Osterweil P, Nygren P, Chan BK, Helfand M. Systematic review of the incidence and consequences of uterine rupture in women with previous caesarean section. BMJ. 2004;329(7456):19-25. doi: 10.1136/bmj.329.7456.19.
2. Al-Zirqi I, Daltveit AK, Forsén L, Stray-Pedersen B, Vangen S. Risk factors for complete uterine rupture. Am J Obstet Gynecol. 2017; 216(2): 165.e1-165.e8. doi: 10.1016/j.ajog.2016.10.017.
3. Tanos V, Toney ZA. Uterine scar rupture - Prediction, prevention, diagnosis, and management. Best Pract Res Clin Obstet Gynaecol. 2019; 59: 115-131. doi: 10.1016/ j.bpobgyn.2019.01.009.
4. Galadanci HS, Ejembi CL, Iliyasu Z, Alagh B, Umer US. Maternal health in North Nigeria: A far cry from the ideal. BJOG. 2007; 114(4): 448-452. doi: 10.1111/j.1471-0528.2007.01229.x.
5. Zwart JJ, Richters JM, Ory F, de Vries JI, Bloemenkamp KW, van Roosmalen J. Uterine Rupture in the Netherlands: a nationwide population based cohort study. BJOG. 2009;116 (8):1069-1080. doi: 10.1111/j.1471-0528.2009. 02136.x.
6. Hofmeyr GJ, Say L, Gulmezoglu AM. WHO Systemic review of maternal mortality and morbidity: The prevalence of Uterine Rupture. BJOG. 2005; 112(9): 1221-28. doi: 10.1111/j.1471 -0528.2005.00725.x.
7. Aliyu SA, Yizengaw TK, Lemma TB. Prevalence and associated factors of uterine rupture during labor among women who delivered in Debre Markos hospital north West Ethiopia. J Intern Med. 2016; 6(4): 1-6. doi: 10.4172/2165-8048. 1000222.
8. Vandenberghe G, Blaere MD, Leeuw VV, Roelens K, Englert Y, Hanssens M, et al. Nationwide population-based cohort study of uterine rupture in Belgium: Results from the Belgian Obstetric

Surveillance System. BMJ Open. 2016; 6(5): e010415. doi: 10.1136/bmjopen-2015-010415.
9. Sunanda N, Ranganth P. A two-year analysis of uterine rupture in pregnancy. Int J Reprod Contracept Obstet Gynecol. 2016; 5(11): 3983-6.
10. Astatikie G, Limenih MA, Kebede M. Maternal and fetal outcomes of uterine rupture and factors associated with maternal death secondary to uterine rupture. BMC Pregnancy Childbirth. 2017; 117. doi: 10.1186/s12884-017-1302-z.
11. Al-Zirqi I, Stray-Pedersen B, Forsén L, Vangen S. Uterine rupture after previous caesarean section. BJOG. 2010; 117(7): 809-820. doi: 10.1111/j.1471-0528.2010.02533.x.
12. Takeya A, Adachi E, Takahashi Y, Kondoh E, Mandai M, Nakayama T. Trial of labor after cesarean delivery (TOLAC) in Japan: rates and complications. Arch Gynecol Obstet. 2020; 301 (4): 995-1001. doi: 10.1007/s00404-020-05492-8.
13. Lehmann S, Baghestan E, Børdahl PE, Irgens LM, Rasmussen SA. Trial of labor after cesarean section in risk pregnancies: A population-based cohort study. Acta Obstet Gynecol Scand. 2019; 98(7): 894-904. doi: 10.1111/aogs.13565.
14. Rizwan N, Abbasi RM, Uddin SF. Uterine rupture, frequency of cases and fetomaternal outcome. J Pak Med Assoc. 2011; 61(4): 322-4.
15. Jain R. Rupture of pregnant uterus: Incidence, risk factors, maternal and fetal outcome**.** Int J Med Res Rev. 2016; 4(6): 1035-41. doi: 10.17511/ijmrr.2016.i06.29.
16. Ofir K, Sheiner E, Levy A, Katz M, Mazor M. Uterine rupture: risk factors and pregnancy outcome. Am J Obstet Gynecol. 2003; 189(4): 1042-6. doi: 10.1067/s0002-9378(03)01052-4.
17. Kadowa I. Ruptured uterus in rural Uganda: prevalence, predisposing factors and outcomes. Singapore Med J. 2010; 51(1): 35-8.
18. Islam A, Shah AA, Jadoon H, Fawad A, Javed M, Abbasi AN. A two-year analysis of uterine rupture in pregnancy. J Ayub Med Coll Abbottabad. 2018; 30(suppl 1)(4): S639-41.
19. Fofie CO, Baffoe P. A Two-year review of uterine rupture in a regional Hospital. Ghana Med J. 2010; 44(3): 98-102. doi: 10.4314/gmg.v44i3.68892.
20. Mukasa PK, Kabakyenga J, Senkungu JK, Ngonzi J, Kyalimpa M, Roosmalen VJ. Uterine rupture in a teaching hospital in Mbarara, western Uganda, unmatched casecontrol study. Reprod Health. 2013; 10: 29. doi: 10.1186/1742-4755-10-29.
21. Lynch JC, Pardy JP. Uterine rupture and scar dehiscence. A five-year survey. Anaesth Intensive Care. 1996; 24(6): 699-704. doi: 10.1177/0310057X9602400612.
22. Hasan JA, Zaki M, Kareem K. Rupture of gravid uterus. J Surg Pak. 2005; 10(1): 20-22.
23. Aziz N, Yousfani S. Analysis of uterine rupture at university teaching hospital Pakistan. Pak J Med Sci. 2015; 31(4): 920-924. doi: 10.12669/pjms.314.7303.
24. Malik HS. Frequency, predisposing factors and fetomaternal outcome in uterine rupture. J Coll Physicians Surg Pak. 2006; 16(7): 472-5.
25. Mbamara SU, Obiechina N, Eleje GU. An analysis of uterine rupture at the Nnamdi Azikiwe University Teaching Hospital Nnewi, Southeast Nigeria. Niger J Clin Pract. 2012; 15(4): 448-52. doi: 10.4103/1119-3077.104524.
26. Alemu AA, Bitew MS, Gelaw KA, Zeleke LB, Kassa GM. Prevalence and determinants of uterine rupture in Ethiopia: a systematic review and meta-analysis. Sci Rep. 2020;10(1):17603. doi:10.1038/s41598-020-74477-z.
27. Fatima N. Rupture of uterus at term. J Coll Physicians Surg Pak. 1998; 8(3): 137-9.
28. Ofir K, Sheiner E, Levy A, Katz M, Mazor M. Uterine rupture: differences between a scarred and an unscarred uterus. Am J Obstet Gynecol. 2004; 191(2): 425-9. doi: 10.1016/j.ajog.2004.01.026.
29. Sahu L. A 10 year analysis of uterine rupture at a teaching institution. J Obstet Gynecol India. 2006; 5(6): 502-6. doi: 10.13140/RG.2.1.3912.2082.

AUTHOR AFFILIATION:

Dr. Rubina Hafeez *(Corresponding Author)*
Assistant Professor
Department of Obstetrics and Gynaecology
Ghulam Muhammad Mahar Medical College/ Hospital Sukkur, Sindh-Pakistan.
Email: docrubi11@yahoo.com

Dr. Rabia Hafeez
Senior Registrar
Department of Radiology
Ghulam Muhammad Mahar Medical College/ Hospital Sukkur, Sindh-Pakistan.

Original Article

Outcome of Platelets Rich Plasma (PRP) in Treatment of Plantar Fasciitis

Farhan Saleem, Kashif Mahmood Khan, Iftikhar Ahmed Memon, Pervez Ali, Zulfiqar Ali, Sadaf Junejo

ABSTRACT

OBJECTIVE: To determine the effectiveness of Platelet-rich plasma (PRP) in the treatment of Plantar fasciitis.

METHODOLOGY: A Quasi-experimental study was conducted at the Department of Orthopedics, Ward-17, JPMC, Karachi, from July 2018 to June 2019. Diagnosed cases of plantar fasciitis, age ranging from 20-60 years, both genders, with failed conservative treatment of 3 months willing to undergo treatment with PRP injection were included. Patients with a previous history of calcaneal fractures, infection, osteoarthritis of currently affected limbs, skin wounds or lesions, diabetes mellitus and other causes of heel pain were excluded. The selection was made from the outdoor department, and intervention was done as a daycare procedure. Two-three ml of centrifuged PRP was injected into the heel. Patients were followed up at 1, 3 and 6-month intervals post-procedure. Findings were recorded on a predesigned proforma VAS, and Roles and Maudsley scoring was done. Data analysis was done using SPSS version 21.

RESULTS: Two hundred and ninety-five patients were enrolled in the study. There were 5 (1.69%) males and 290 (98.3%) females. 100 (33.89%) patients were between 20-40 years. 195 (66.10%) patients were between 41-60 years. By 3rd follow-up visit, i.e., six months post-intervention, excellent results were obtained in 149 (50.5%) patients. 136 (46.1%) showed good (VAS = 1 to 4) results, 07 (2.37%) had acceptable (VAS = 4 to 6) results and 03 (1.01%) had poor (VAS ≥ 7) results.

CONCLUSION: The present study reported that Platelet-rich plasma (PRP) injection successfully improved pain symptoms in most patients, with at least half of the population reporting excellent outcomes.

KEYWORDS: Inflammation, Platelet-rich plasma, Plantar fasciitis.

This article may be cited as: Saleem F, Khan KM, Memon IA, Ali P, Ali Z, Junejo S. Outcome of Platelets Rich Plasma (PRP) in Treatment of Plantar Fasciitis. J Liaquat Uni Med Health Sci. 2022;21(02):111-6. doi: 10.22442/jlumhs.2022.00921.

INTRODUCTION

Plantar fasciitis is a common cause of heel pain in 11-15 % of adults in the age group between 40-60 years, requiring professional care[1]. It is believed to result primarily from repetitive microtrauma and excessive strain on the plantar fascia[2]. It is a non-inflammatory, degenerative process[3]. Risk factors are tightness of Tendo Achilles or gastrocnemius muscle, obesity, weight-bearing professions, advanced age, poor footwear, overtraining and reduced subtalar joint mobility[4]. It is a problematic condition treat. Non-surgical management includes rest, structured physical therapy, home stretching exercises, heel cushions, orthoses, ice, NSAIDs, weight loss, night splinting and periods of immobilization[5,6]. Invasive techniques include corticosteroid injection, PRP injection, botulinum toxin injection and Extracorporeal Shock Wave Therapy (ESWT). Surgical procedures include plantar fasciotomy and gastrocnemius recession[6-8].

Received: ***15-10-2020***
Revised: ***27-05-2022***
Accepted: ***30-05-2022***

Platelet-rich plasma (PRP) is an autologous concentration of human platelets in a small plasma volume[9]. It can be seen as a small fluffy or cloudy layer between the top clear plasma and bottom red cell layers. Concentrating seven fundamental protein growth factors enhances tendon and ligament healing by initiating the body's natural healing response[10]. PRP use in treating plantar fasciitis is a relatively recent and evolving concept. There are inconsistencies in the current literature. Furthermore, there is not enough literature available from local regions. Demographics and ethnic components can significantly impact patients' responses to specific treatments and alter disease course.

Therefore, the current study was conducted to evaluate the efficacy of Platelet-rich plasma (PRP) in improving the pain in patients with plantar fasciitis presenting to a tertiary care centre in Sindh, Pakistan.

METHODOLOGY

A prospective observational study was conducted in the Department of Orthopedics, Jinnah Postgraduate Medical Centre (JPMC), Karachi, from July 2018 to June 2019. A non-probability convenience sampling

technique was used to enroll the participants in the study.

Patients included were aged between 20-60 years, of both genders, with a symptomatic Plantar Fasciitis of at least three months duration, willing to undergo intervention, failed conservative treatment, and never had PRP injection. Those with previous calcaneum fracture, inflammatory arthritis, osteoarthritis around the ankle, wound or skin in the ankle, nerve-related symptoms, and patients with diabetes mellitus, and hypertension, were excluded.

Approval from the JPMC ethics committee was taken for the study, and the proforma was prepared. Patients were selected from the outdoor patient department for the procedure. The procedure was performed at a daycare. Patients were explained the study's purpose, and the procedure's pros and cons were discussed. Informed consent was taken.

A consultant and senior resident performed the entire procedure using the standard technique of 20 ml of venous blood drawn from each patient. Drawn blood was put in a centrifuge container with citrate dextrose anticoagulant. Blood was centrifuged in a centrifuge machine at 3200 revolutions per minute. 2-3 ml PRP layer was obtained from 20 ml blood and separated in a 10-cc Syringe, and PRP was prepared as per the latest guidelines and instructions[11]. PRP was obtained after taking the informed consent of the participant. 3 to 5 ml of blood was procured after checking for baseline platelet counts of the patient. Citrate dextrose was added to the blood drawn to prevent platelet activation. We used a tabletop cold centrifuge device to perform differential centrifugation.

All patients taking NSAIDs were requested to cease the treatment at least one week before. Using all aseptic measures, PRP was injected from the medial side into the point of maximum tenderness at the base of the plantar fascia origin from the calcaneus tubercle. Every patient received a single injection of PRP.

Patients were sent home with the necessary instructions and medications. They were advised to avoid strenuous activity for at least four weeks and followed up at one-month, three-month and six-month intervals. Per visit, the pain was recorded using the Visual Analogue Scale (VAS).

The final outcome was obtained by using Roles and Maudsley scores. Modified criteria of the Roles and Maudsley scoring is, Excellent: No pain (VAS = 0, patient satisfied with the treatment outcome and unlimited walking without pain), Good: Symptoms substantially decreased (VAS = 1-4, patient satisfied with the treatment outcome and ability to walk without pain for greater than one hour), Acceptable: Symptoms somewhat decreased (VAS = 5-6, patient slightly satisfied with the treatment outcome), Poor: Symptoms identical (VAS > 7, patient not satisfied with treatment outcome). Findings and data were recorded on a predesigned proforma. Bias and confounders (e.g., comorbidities such as hypertension, diabetes, etc.) were controlled by strictly following the inclusion and exclusion criteria as these may impact the patient outcome.

Statistical package of social sciences version 21 was used for data compilation and analysis. Frequency and percentage were computed for qualitative variables like gender, obesity, socioeconomic status, education, side involved and outcome. Quantitative variables were presented as mean ± SD like age, disease duration, height, weight, BMI, and pre and post-treatment pain scores. Effect modifiers like gender, age, BMI, obesity, disease duration, socioeconomic status, education, and side involved were controlled through stratification. Post-stratification Chi-square test was applied, and P-value $\leq$ 0.05 was considered significant.

RESULTS

Two hundred ninety-five patients were included in the study, 05 (1.7%) were males, and 290 (98.3%) were females with a mean age of 45.39±12.49 years. 171 (57.96%) patients had bilateral plantar fasciitis. In 70 (23.72%) patients' the right heel was involved and in 54 (18.3%) patients, left heel plantar fasciitis was involved (**Table I**).

TABLE I: BASELINE DEMOGRAPHICS

Parameters		n=295
Age (Years)		45.39±12.49
Height (cm)		153.00±9.16
Weight (Kg)		73.16±12.21
BMI (kg/m2)		31.46±5.55
Duration of Procedure (minutes)		37.68±10.16
Gender	Male	5 (1.7)
	Female	290 (98.3)
Obesity	Yes	250 (84.7)
	No	45 (15.3)
Socioeconomic status (PKR)	10,000-24,000	95 (32.2)
	25,000-50,000	150 (50.8)
	> 50,000	50 (16.9)
Education status	Not Educated	98 (33.2)
	Primary to Secondary	143 (48.5)
	Intermediate to Graduate	44 (14.9)
	More than graduate	10 (3.4)
Site involved	Right	70 (23.7)
	Left	54 (18.3)
	Bilateral	171 (58.0)

Visual analogue score	**Baseline**	Mild (1-3)	67 (22.7)
		Moderate (4-6)	106 (35.9)
		Severe(>=7)	122 (41.4)
	1st follow up	No Pain (VAS=0)	45 (15.3)
		Mild (1-3)	63 (21.4)
		Moderate (4-6)	107 (36.3)
		Severe(>=7)	80 (27.1)
	2nd follow up	No Pain (VAS=0)	75 (25.4)
		Mild (1-3)	83 (28.1)
		Moderate (4-6)	95 (32.2)
		Severe(>=7)	42 (14.2)
	3rd follow up	No Pain (VAS=0)	149 (50.5)
		Mild (1-3)	136 (46.1)
		Moderate (4-6)	7 (2.4)
		Severe(>=7)	3 (1.0)
Outcome score		Acceptable	7 (2.4)
		Excellent	149 (50.5)
		Good	136 (46.1)
		Poor	3 (1.0)

According to the Visual analogue score, at 1 month follow-up 45 (15.3 %) patients showed excellent (VAS = 0) results to platelet rich plasma therapy. 63 (21.4%) patients showed good (VAS = 1 to 4) results, 107 (36.3%) patients showed acceptable (VAS = 4 to 6) results and 80 (27.1%) patients showed poor (VAS ≥ 7) results. At 6 months follow up, 149 (50.5%) patients showed excellent (VAS = 0) results to platelet rich plasma therapy. 136 (46.1%) patients showed good (VAS = 1 to 4) results, 07 (2.37%) patients showed acceptable (VAS = 4 to 6) results and 03 (1.01%) patients showed poor (VAS ≥ 7) results (**Table I**).

FIGURE I: CHANGE IN VAS SCORE FROM BASELINE AND UP TO 6 MONTHS (3RD FOLLOW-UP VISIT)

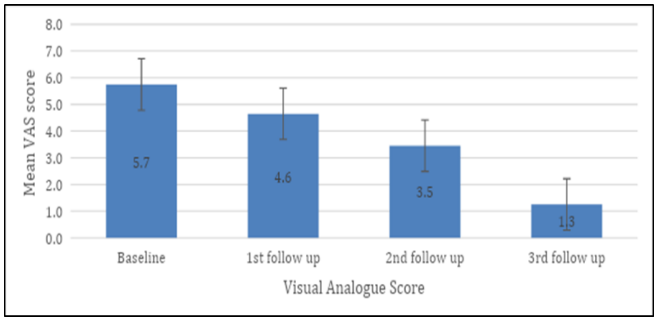


TABLE II: ASSOCIATION OF DEMOGRAPHICS AND PATIENT OUTCOME

		Outcome score				P-value
		Acceptable	**Excellent**	**Good**	**Poor**	
Age years	<= 30	0 (0.0%)	28 (57.1%)	19 (38.8%)	2 (4.1%)	0.172
	31 - 40	2 (3.9%)	29 (56.9%)	20 (39.2%)	0 (0.0%)	
	41 years - 50	3 (4.4%)	30 (44.1%)	34 (50.0%)	1 (1.5%)	
	51 years & above	2 (1.6%)	62 (48.8%)	63 (49.6%)	0 (0.0%)	
Gender	Female	7 (2.4%)	146 (50.3%)	134 (46.2%)	3 (1.0%)	0.959
	Male	0 (0.0%)	3 (60.0%)	2 (40.0%)	0 (0.0%)	
BMI categories	< 18.5	0 (0.0%)	8 (53.3%)	7 (46.7%)	0 (0.0%)	0.009*
	18.5 to < 25	3 (13.6%)	9 (40.9%)	10 (45.5%)	0 (0.0%)	
	25 to < 30	0 (0.0%)	5 (50.0%)	4 (40.0%)	1 (10.0%)	
	30 & above	4 (1.6%)	127 (51.2%)	115 (46.4%)	2 (0.8%)	
Obesity	Yes	4 (1.6%)	128 (51.2%)	116 (46.4%)	2 (0.8%)	0.167
	No	3 (6.7%)	21 (46.7%)	20 (44.4%)	1 (2.2%)	
Educational status	Intermediate to Graduate	0 (0.0%)	9 (20.5%)	35 (79.5%)	0 (0.0%)	0.001*
	More than graduate	0 (0.0%)	9 (90.0%)	1 (10.0%)	0 (0.0%)	
	Not Educated	2 (2.0%)	55 (56.1%)	40 (40.8%)	1 (1.0%)	
	Primary to Secondary	5 (3.5%)	76 (53.1%)	60 (42.0%)	2 (1.4%)	
Socioeconomic status	10,000- 24,000	1 (1.1%)	52 (54.7%)	40 (42.1%)	2 (2.1%)	0.451
	25,000-50,000	4 (2.7%)	69 (46.0%)	76 (50.7%)	1 (0.7%)	
	> 50,000	2 (4.0%)	28 (56.0%)	20 (40.0%)	0 (0.0%)	
Site involve	Bilateral	4 (2.3%)	77 (45.0%)	88 (51.5%)	2 (1.2%)	0.254
	Left	2 (3.7%)	28 (51.9%)	23 (42.6%)	1 (1.9%)	
	Right	1 (1.4%)	44 (62.9%)	25 (35.7%)	0 (0.0%)	

TABLE III: COMPARISON BETWEEN BASELINE, 1ST, 2ND AND 3RD FOLLOW-UP REGARDING VISUAL ANALOGUE SCORE (VAS) SCORE

		Mean	Std. Deviation	Minimum	Maximum	P-value
Visual analogue score (VAS)	Baseline	5.75	2.54	1	10	0.001*
	1st follow up	4.65	3.03	.0	10.0	
	2nd follow up	3.45	2.86	.0	10.0	
	3rd follow up	1.25	1.51	.0	8.0	

Results were more satisfactory in educated patients than non-educated ones, as shown by their compliance with the therapy. Similarly, body mass index also affected the efficacy of PRP. Patients' outcomes did not differ significantly (p=0.172) in different age groups, thus indicating that age did not impact the patient outcome. (**Table II**).

Figure I illustrate the change in VAS from baseline to the last follow-up. The difference was most significant at first follow-up, and gradually the change decreased because the baseline pain subsided with time. Pain score when compared from baseline to last follow-up, there was a statistically significant difference P-Value < 0.05. **Table III**.

DISCUSSION

After trying different treatment options for plantar fasciitis, researchers attempted to explore treatments which could be safe, cost-effective, noninvasive and give satisfactory early and long-term results. Their attention was drawn towards Platelet-rich plasma (PRP) when its role in the healing of various problems of tendons and fasciae gradually started getting proven [6]. PRP use in plantar fasciitis has satisfactory results without any severe side effects, as it is autologous[6,8]. The present study indicated that PRP injection resulted in reduced pain among patients with plantar fasciitis. The study observed no side effects, including vomiting, infection, skin discoloration, allergic reaction, etc., were observed in the study. Furthermore, we also observed decreasing VAS on subsequent follow-ups (**Table III**). In line with the current study, a study by Acosta-Olivoet et al.[12] revealed the change in mean VAS at three months of PRP treatment from 2.42 ±1.45 to 0.62 ±0.73.

A study by Gonnade N et al[13] had similar findings as our study that PRP injection in plantar fasciitis has better long-term efficacy. Chiew SK 2016[7] showed that PRP injection had a better outcome than conservative treatment. Jain K 2015[14] had better long-term effects of PRP injection than other treatments. Shetty SH 2019[15] in their research, showed better long-term results and lesser reinjections of PRP in plantar fasciitis than conservative and other forms of invasive treatment. Jimenez-Perez AE 2019[16] revealed that PRP is efficient, safe and has a long-standing effect on plantar fasciitis when injected compared to other injections.

Ling Y 2018[17] in their study showed that PRP injection has a better effect and is more durable in the long term than other invasive methods. Singh P 2017[18] revealed that PRP injection has better improvement in pain and function than other modalities used for plantar fasciitis treatment. Vahdatpour B 2016[19] showed that PRP injection in the heel improved pain and functional limitation due to plantar fasciitis. Acosto -Olivo C et al[12] showed that PRP injection was very effective and produced results comparable to corticosteroid injection. Monto RR 2014[20] showed better results with PRP injection compared to other forms of invasive procedures. Wilson JJ 2014[21] & Shetty VD 2014[22] in their studies showed promising results of PRP injection in plantar fasciitis. A recent meta-analysis found that even though PRP revealed more substantial improvement in VAS than other treatments, it did not affect the Roles–Maudsley score (RMS)[17]. Therefore, we remain unclear on whether PRP treatment is durable for long-term or not and large-scale, multicenter studies are needed to confirm the current claims. The outcome of PRP can also alter the quality and purity of PRP depending upon the technique used for preparing PRP[11].

One limitation of our study is that it did not have a comparative group to assess the PRP modality with other treatment regimes. Therefore, we cannot judge whether PRP treatment is better than corticosteroids or not. Further research is indeed warranted. However, our research showed similar findings to all the above studies that PRP injection in plantar fasciitis shows good results, improving pain and functions.

CONCLUSION

Platelet-rich plasma (PRP) injection in treating plantar fasciitis is very effective in the short-term and long-term modalities for relieving symptoms. The present study reported that Platelet-rich plasma (PRP) injection successfully improved pain symptoms in most patients, with at least half of the population reporting excellent outcomes. Further research is indeed warranted to explore the subject in depth.

Ethical permission: Jinnah post Graduate Medical Center Karachi ERC letter No. F.2-81/2021-GENL/69221/JPMC, dated 03-11-2021.

Conflict of Interest: There is no conflict of interest among the authors

Funding: Funding was not requested/self-funded

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Saleem F: Data collection
Khan KM: Data interpretation
Memon IA: Manuscript drafting and writing
Ali P: Data interpretation
Ali Z: Critical review of manuscript
Junejo S: Data collection

REFERENCES

1. Yang WY, Han YH, Cao XW, Pan JK, Zeng LF, Lin JT et al. Platelet-rich plasma as a treatment for plantar fasciitis: A meta-analysis of randomized controlled trials. Medicine(Baltimore). 2017; 96(44): e8475. doi: 10.1097/MD.0000000000008475.
2. Rasenberg N, Bierma-Zeinstra SM, Bindels PJ, van der Lei J, van Middelkoop M. Incidence, prevalence, and management of plantar heel pain: a retrospective cohort study in Dutch primary care. Br J Gen Pract. 2019; 69(688): e801-808. doi: 10.3399/bjgp19X706061.
3. Muralidharagopalan NR, Loganathan D, Iyer KM, Boopathikumar KK. Functional outcome of platelet -rich plasma injection in plantar fasciitis. Intern J Res Orthopaed. 2017; 3(4): 734-7. doi: 10.18203/issn.2455-4510
4. Thomas MJ, Whittle R, Menz HB, Rathod-Mistry T, Marshall M, Roddy E. Plantar heel pain in middle-aged and older adults: population prevalence, associations with health status and lifestyle factors, and frequency of healthcare use. BMC Musculoskelet Disord. 2019; 20(1): 337. doi: 10.1186/s12891-019-2718-6.
5. Batson JP, Locke MD. Foot and Ankle Injuries. In The Adolescent Athlete 2018 (pp. 275-308). Springer, Cham.
6. Al-Boloushi Z, López-Royo MP, Arian M, Gómez-Trullén EM, Herrero P. Minimally invasive non-surgical management of plantar fasciitis: A systematic review. J Bodyw Mov Ther. 2019; 23 (1): 122-37. doi: 10.1016/j.jbmt.2018.05.002.
7. Chiew SK, Ramasamy TS, Amini F. Effectiveness and relevant factors of platelet-rich plasma treatment in managing plantar fasciitis: A systematic review. J Res Med Sci. 2016; 21: 38. doi: 10.4103/1735-1995.183988.
8. Boakye L, Chambers MC, Carney D, Yan A, Hogan MV, Ewalefo SO. Management of symptomatic plantar fasciitis. Oper Tech Orthop. 2018; 28(2): 73-8. doi: 10.1053/j.oto.2018.02.001.
9. Alkhatib N, Salameh M, Ahmed AF, Alkaramany E, Ahmed G, Mekhaimar MM et al. Platelet-rich plasma versus corticosteroids in the treatment of chronic plantar fasciitis: a systematic review and meta-analysis of prospective comparative studies. J Foot Ankle Surg. 2020; 59(3): 546-52. doi: 10.1053/j.jfas.2019.10.003.
10. Cheng H, Zhang J, Li J, Jia M, Wang Y, Shen H. Platelet-rich plasma stimulates angiogenesis in mice which may promote hair growth. Eur J Med Res. 2017; 22: 39.
11. Dhurat R, Sukesh M. Principles and Methods of Preparation of Platelet-Rich Plasma: A Review and Author's Perspective. J Cutan Aesthet Surg. 2014; 7(4): 189-97. doi: 10.4103/0974-2077.150734.
12. Acosta-Olivo C, Elizondo-Rodriguez J, Lopez-Cavazos R, Vilchez-Cavazos F, Simental-Mendia M, Mendoza-Lemus O. Plantar Fasciitis-A Comparison of Treatment with Intralesional Steroids versus Platelet-Rich Plasma- A Randomized blinded study. J Am Podiatr Med Assoc. 2017 Nov; 107(6): 490-496. doi: 10.7547/15-125.
13. Gonnade N, Bajpayee A, Elhence A, Lokhande V, Mehta N, Mishra M et al. Regenerative efficacy of therapeutic quality platelet-rich plasma injections versus phonophoresis with kinesiotaping for the treatment of chronic plantar fasciitis: A prospective randomized pilot study. Asian J Transfus Sci. 2018; 12(2): 105-111. doi: 10.4103/ajts.AJTS_48_17.
14. Jain K, Murphy PN, Clough TM. Platelet rich plasma versus corticosteroid injection for plantar fasciitis: A comparative study. Foot (Edinb). 2015; 25(4): 235-7. doi: 10.1016/j.foot.2015.08.006.
15. Shetty SH, Dhond A, Arora M, Deore S. Platelet-Rich Plasma Has Better Long-Term Results Than Corticosteroids or Placebo for Chronic Plantar Fasciitis: Randomized Control Trial. J Foot Ankle Surg. 2019; 58(1): 42-46. doi: 10.1053/j.jfas.2018.07.006.
16. Jiménez-Pérez AE, Gonzalez-Arabio D, Diaz AS, Maderuelo JA, Ramos-Pascua LR. Clinical and imaging effects of corticosteroids and platelet-rich plasma for the treatment of chronic plantar fasciitis: A comparative non-randomized prospective study. Foot Ankle Surg. 2019; 25(3): 354-360. doi: 10.1016/j.fas.2018.01.005.
17. Ling Y, Wang S. Effects of platelet-rich plasma in the treatment of plantar fasciitis: A meta-analysis of randomized controlled trials. Medicine (Baltimore). 2018 Sep;97(37): e12110. doi: 10.1097/MD.0000000000012110.
18. Singh P, Madanipour S, Bhamra JS, Gill I. A systematic review and meta-analysis of platelet-rich plasma versus corticosteroid injections for plantar fasciopathy. Int Orthop. 2017; 41(6): 1169-81. doi: 10.1007/s00264-017-3470-x.
19. Vahdatpour B, Kianimehr L, Moradi A, Haghighat S. Beneficial effects of platelet-rich plasma on

improvement of pain severity and physical disability in patients with plantar fasciitis: A randomized trial. Adv Biomed Res. 2016; 5: 179. doi: 10.4103/2277-9175.192731.
20. Monto RR. Platelet-rich plasma efficacy versus corticosteroid injection treatment for chronic severe plantar fasciitis. Foot Ankle Intern. 2014; 35(4): 313-8. doi: 10.1177/1071100713519778.
21. Wilson JJ, Lee KS, Miller AT, Wang S. Platelet rich plasma for treatment of chronic plantar fasciopathy in adults: a case series. Foot Ankle Spec. 2014; 7(1): 61-7. doi: 10.1177/1938640013509671.
22. Shetty VD, Dhillon M, Hedge C, Jagtap P, Shetty S. A study to compare the efficacy of corticosteroid therapy with platelet-rich plasma therapy in recalcitrant plantar fasciitis: a preliminary report. Foot Ankle Surg. 2014; 20(1):

AUTHOR AFFILIATION:

Dr. Farhan Saleem
Postgraduate Trainee
Department of Orthopaedics
Jinnah Postgraduate Medical Centre (JPMC)
Karachi, Sindh-Pakistan.

Dr. Kashif Mahmood Khan
Associate Professor
Department of Orthopaedics
JPMC, Karachi, Sindh-Pakistan.

***Dr. Iftikhar Ahmed Memon** *(Corresponding Author)*
Senior Registrar
Department of Orthopaedics Surgery
JPMC, Karachi, Sindh-Pakistan.
*Department of Orthopedic Surgery
Liaquat University of Medical & Health Sciences
Jamshoro, Sindh-Pakistan.
Email: dr.iftikharmemon@gmail.com

Dr. Pervez Ali
Assistant Professor
Department of Orthopedics Surgery
JPMC, Karachi, Sindh-Pakistan.

Dr. Zulfiqar Ali
Consultant Orthopedic Surgeon
Alkamil General Hospital
Kingdom of Saudi Arabia.

Dr. Sadaf Junejo
Senior Registrar
Department of Pediatric
NICH, Karachi, Sindh-Pakistan.

Original Article

To Determine Clinical Outcome of Platelet Rich Fibrin in Pulpotomy of Permanent Teeth in Irreversible Pulpitis

Ashique Hussain Sahito, Saleem Raza Kuhuawar, Abdul Latif Jokhio, Muhammad Refique Tagar, Mushtaque Ahmed Shaikh, Mujeeb Rehman Kalwar

ABSTRACT

OBJECTIVE: To determine the clinical efficacy of platelet-rich fibrin (PRF) in Pulpotomy of permanent teeth in irreversible pulpitis.

METHODOLOGY: This observational study was conducted in the Department of Operative Dentistry, Liaquat University of Medical and Health Sciences, Jamshoro / Hyderabad, from January to December 2019, through the non-probability purposive sampling technique. Fifty patients were included of both genders, ranging from 18-50 years. Irreversible pulpitis was diagnosed by lingering pain on hot and cold touch with normal peri-apical status. The written consent was taken from all participants. Each patient was evaluated clinically for the presence of pain, and peri-apical radiographs were taken. A visual analog scale (VAS) measured patients' pain before and after treating pulpitis. After treatment of patients, the efficacy of PRF was evaluated by a pain scale. The results were statistically compiled by SPSS version-21 and applying the "*t*"-test.

RESULTS: The severity of pain was observed as; severe in 18 (36%), moderate in 28 (56%) and mild in 4 (8%) patients before starting the treatment. After 24 hours treating with PRF, 40 (80%) patients became pain-free, 1 (1%) with moderate, while the 9 (18%) patients were observed with mild pain; the results obtained were highly significant with a p-value <0.05.

CONCLUSION: PRF is effective for treating irreversible pulpitis occurring in permanent teeth.

KEYWORDS: PRF, VAS, Permanent teeth, Pulpotomy, irreversible pulpitis.

This article may be cited as: Sahito AS, Kuhuawar SR, Jokhio AL, Tagar MR, Shaikh MA, Kalwar MR. To Determine Clinical Outcome of Platelet Rich Fibrin in Pulpotomy of Permanent Teeth in Irreversible Pulpitis. J Liaquat Uni Med Health Sci. 2022;21(02):117-20. doi: 10.22442/jlumhs.2021.00823. Epub 2021 March 11.

INTRODUCTION

Pulpitis is pulp inflammation, clinically categorized as reversible and irreversible pulpitis. If the pain lasts for 1 to 2 seconds by touching the cold stimulus, which is reversible and persists for more than 10 seconds is termed irreversible pulpitis. The pain of irreversible pulpitis is very shocking. Tooth decay and its sequelae are the causes of pulpitis and tooth loss worldwide. Likewise, pulpitis is more common in South Asia, including Pakistan[1]. It is a great challenge to maintain the integrity of teeth. The vitality of the dentine-pulp complex is fundamental for the health of a tooth; therefore, priority should be given to preserving vitality through clinical assessment and management strategies.

Root canal treatments were performed in cases of irreversible pulpitis for so long. Its major drawback was the loss of vitality, and the tooth became easily breakable[2] as; the series of studies are recommending that Pulpotomy, which is the removal of coronal pulp and capping of radicular pulp with PRF, which is a straightforward clinical approach to overcome the irreversible pulpitis in treating the permanent teeth. PRF is separated from the blood sample of the same patient to reduce the chances of material interaction and is called autologous[3]. It is cheaper and easily accessible. The material promotes the healing potential of the remaining radicular pulp in root canals. It contains fibrin and multiple growth factors to encourage the formation of dentine[4]. Therefore the material was used to evaluate its efficacy after Pulpotomy in permanent molars for relieving the pain[5].

Received: ***26-11-2020***
Revised: ***12-02-2021***
Accepted: ***23-02-2021***
Published Online: ***11-03-2021***

METHODOLOGY

This observational study was conducted in the Department of Operative Dentistry, Liaquat University of Medical & Health Sciences, Jamshoro/Hyderabad, from January to December 2019, using a non-probability purposive sampling technique. The sample size consisted of 50 patients, including both genders, and written consent was taken from each patient. The inclusion criteria included; age from 18-50 years, having no history of chronic diseases like DM, TB, CLD and viral illness. While the patients having teeth with necrosed pulp, third molars, and teeth showing periapical radiolucency on radiograph were excluded from the study.

The participants with normal peri-apical status were included in this study, complaining of irreversible pulpitis. In patients with treatment of pulpitis, before and after 24 hours, the severity of pain was measured by a visual analog scale (VAS). The scale ranges from 0, i.e. no pain and the severity of pain increases as the range of scale increases, i.e. from 1 to 10, so the severity of pain increases accordingly. The periapical radiographs were repeated after six-month intervals and showed no periapical radiolucency; such patients were considered successful with the treatment.

Laboratory Procedure for Preparation of PRF: The blood sample was collected by a 10-ml syringe from each patient under all aseptic measures, which was immediately transferred to a 20 ml glass container. It was centrifuged at 3000 RPM for 10 minutes. After centrifugation, the glass tube showed three layers, out of which the superficial layer was plasma, the middle layer showed the fibrin clot, PRF, while the lower layer contained cells. The middle layer of the fibrin clot was separated and placed in the cold container for use, while the superficial and lower cellular layers were discarded.

The results were statistically compiled by SPSS version-21, and the "*t"*-test was used to compare the effects before and after treating patients.

RESULTS

The data results showed the efficacy of PRF among all the 50 patients with pulpitis, including both genders. Table I shows the age-wise distribution of 50 patients, including 33 males (66%) and 17 females (34%); included patient mean age was 33.28±6.5, and the male to female ratio was 1.94: 1. The number of patients with pulpitis was 10(20%) males, and 5(10%) were female with an age range from 18 to 30 years. The age ranges from 31 to 40 years, comprising 16 (32%) males and 10(20%) females. While the ages range from 41 to 50, 7(14%) were male, and 2(4%) were female. Table II shows the pain scale (VAS) description of patients with pre and posts pulpitis treatment. The pain scale (VAS) shows no pain (0), mild pain (1-3), moderate pain (4-6), and severe pain (7-10).

The findings of our study showed that 40 patients (80%) with post pulpitis treatment had a 0 scale, and no patient with pre-pulpitis treatment with having 0 scale was found. The number of patients with pre-pulpitis treatment was 04 (8%), and the number of patients with post pulpitis treatment was 9(18%) patients with a 1 - 3 pain scale. The number of patients with pre-pulpitis treatment was 28 (56%), and the number of patients with post pulpitis treatment was 01 patients (02%), having a 4-6 pain scale. The number of patients with pre-pulpitis treatment was 18 (36%) with a 7-10 pain scale, and no patient post pulpitis treatment was observed.

The number of above all patients, pre and post pulpitis treatment were compared with each other by applying the "*t*"- test statistically, which shows a highly significant p-value (< 0.05).

TABLE I:
AGE-WISE DISTRIBUTION OF PULPITIS PATIENTS

Age in Years	Male (n=33)	Female (n=17)	Percentage (%)
18 – 30	10 (20%)	05 (10%)	30
31 - 40	16 (32%)	10 (20%)	52
41 – 50	07 (14%)	2 (4%)	18
Total	**33 (66%)**	**17 (34%)**	**100**

TABLE II: **PAIN SCALE OF PATIENTS WITH PRE AND POST PULPITIS TREATMENT**

Pain Scale (VAS)	PULPITIS			
	PRE		POST	
	No. of Patients	%	No. of Patients	%
No Pain=0	0	0%	40	80%
Mild Pain =1-3	4	8%	9	18%
Moderate Pain= 4-6	28	56%	1	2%
Severe Pain = 7-10	18	36%	0	0%
Total	50	100%	50	100%
p-Value	0.005			

DISCUSSION

Tooth decay of permanent teeth is a prevalent disease affecting all world populations. Especially during early or six to seven years of age, all 1st molars are erupted, which are more affected, resulting in pulpitis[6]. Pulp exposure may cause an acutely painful condition. The disease is also frequent in our population and almost affects all age groups[7]. To relieve the pain, it is the first priority of clinicians to do the root canal treatment as a prior option. The pulp tissue is completely removed during the root canal, and tooth vitality is compromised as it is cost-effective and time-consuming with more chances of treatment failure[8]. Hence, the tooth becomes liable to break. Therefore, Pulpotomy is gaining popularity as this treatment maintains the vitality of pulp. PRF material is readily available and can easily be derived from patients' blood samples. But there is a matter of patient anxiety in blood sampling. As PRF has many growth factors, it can maintain the vitality of pulp in root canals after Pulpotomy by forming a calcification bridge[9].

The material selection was due to its autologous nature, and the material's efficacy was evaluated in fifty patients, which showed a high success rate[10]. The male to female ratio was 1.94: 1, which shows the

increased frequency of the male population suffering pulpitis pain compared to female patients. This is in accordance with other studies, showing a male to female ratio of 1.36: 1 [11]. A maximum number of cases was observed in the 4th decade of life, i.e. 31-40 years of age, with the least number of cases in the 3rd and 5th decade of life. That shows more frequent irreversible pulpits in the fourth decade of life in patients attending LUMHS hospital. This result is different from the other studies conducted among other populations because they have included patients aged 18-79 years[12].

The maintenance of tooth vitality preserves the sensory function of the pulp, which is essential for the defense of the tooth due to its extensive innervation of nerve fibers, which give an indication or warning when it is under attack from noxious stimuli[13].

This study observed that 40 patients (80%) were pain-free within 24 hours. The use of PRF relieved the pain of 44 patients (88%) after a week, and after two weeks, 94% of patients were pain-free, following other studies that report a 94.4% success rate[14].

Vital pulp also plays an essential role in the induction and the formation of tertiary/reparative dentin to external stimuli[15]. Dental radiographs such as the bitewing and long cone paralleling technique were used as an additional tool to detect any visible periapical pathology before treatment[16]. And such teeth were excluded. After six months of treatment, radiographs were taken to find any visible defect[17]. In 47 patients (94%), radiographs showed no periapical pathology. At the same time, an abnormality was visible in 3 patients (6%) [18]. This study indicates that PRF as pulp capping material relieves the pain of the pulpit with a high success rate. The studies also support the use of PRF in treating irreversible pulpitis in permanent and deciduous teeth or milk teeth[19]. As per our knowledge, no such study had been conducted, so this research was carried out, and the results were significant.

CONCLUSION

It has been concluded that PRF is an effective material for treating irreversible pulpitis in permanent teeth.

Ethical Permission: Liaquat University of Medical & Health Sciences Jamshoro ERC letter No. LUMHS/ REC/-701, dated 17-8-2018.

Conflict of Interest: There is no conflict of interest among the authors

Funding: Funding was not requested/self-funded

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Sahito AH: Conception, design, collection and data collection
Khuhawar SR: Critical revision of the article for important intellectual content, final approval of the manuscript
Jokhio AL: Drafting of manuscript, data analysis & interpretation
Tagar MR: Data analysis & interpretation
Ahmed M: Critical revision of the manuscript, data analysis
Kalwar MR: Statistical & data analysis

REFERENCES

1. Manhas M, Mittal S, Sharma AK, Gupta KK, Pathania V, Thakur V. Biological approach in repair of partially inflamed dental pulp using second-generation platelet-rich fibrin and mineral trioxide aggregate as a pulp medicament in primary molars. J Indian Soc Pedod Prev Dent. 2019; 37(4): 399-404. doi: 10.4103/JISPPD.JISPPD_133_19.
2. Zanini M, Hennequin M, Cousson PY. Which procedures and materials could be applied for full Pulpotomy in permanent mature teeth? A systematic review. Acta Odont Scand. 2019; 77 (7): 541-51. doi: 10.1080/00016357.2019.1614217.
3. Mohamed NR, Basha S, Al-Thomali Y. Efficacy of platelet concentrates in Pulpotomy–a systematic review. Platelets. 2018; 29(5): 440-5. doi: 10.1080/09537104.2018.1445844.
4. Seck A, Kaboré WA, Ndiaye D, Ndiaye I, Benoist FL. Radiological and clinical assessment of Pulpotomy on mature permanent molars with irreversible pulpitis: literature review. IP Indian J Conserv Endod. 2018; 3(4): 104-15. doi: 10.18231/2456-8953.2018.0025.
5. Galani M, Tewari S, Sangwan P, Mittal S, Kumar V, Duhan J. Comparative evaluation of postoperative pain and success rate after pulpotomy and root canal treatment in cariously exposed mature permanent molars: a randomized controlled trial. J Endod. 2017; 43(12): 1953-62. doi: 10.1016/j.joen.2017.08.007.
6. Sabbagh S, Shirazi AS, Eghbal MJ. Vital pulp therapy of a symptomatic immature permanent molar with long-term success. Iran Endod J. 2016; 11(4): 347-49. doi: 10.22037/iej.2016.19.
7. Linas N, Decerle N, Munoz-Sanchez ML, Faulks D, Collado V, Nicolas E et al. Long-term outcomes of full Pulpotomy in permanent molars for patients treated in a single, short session under special conditions. J Endod. 2020; 46 (11): 1597-1604. Doi: 10.1016/j.joen.2020.08.003.
8. Kumar V, Juneja R, Duhan J, Sangwan P, Tewari S. Comparative evaluation of platelet-rich fibrin, mineral trioxide aggregate, and calcium hydroxide as pulpotomy agents in permanent molars with

irreversible pulpitis: A randomized controlled trial. Contemp Clin Dent. 2016; 7(4): 512-518. doi: 10.4103/0976-237X.194107.
9. Munir A, Zehnder M, Rechenberg DK. Wound Lavage in Studies on Vital Pulp Therapy of Permanent Teeth with Carious Exposures: A Qualitative Systematic Review. J Clin Med. 2020; 9(4): 984. doi: 10.3390/jcm9040984.
10. Raja SV, Naidu ME. Platelet-rich fibrin: Evolution of a second-generation platelet concentrate. Indian J Dent Res. 2017; 19(1): 42-6. doi: 10.4103/0970-9290.38931.
11. Boonstra AM, Stewart RE, Köke AJ. Cut-Off points for mild, moderate, and severe pain on the numeric rating scale for pain in patients with chronic musculoskeletal pain: Variability and influence of sex and catastrophizing. Front Psychol. 2016; 7: 1466. doi: 10.3389/fpsyg.2016.01466.
12. Chen E, Abbott PV. Dental Pulp Testing: A Review. Int J Dent. 2009; 2009: 365785. doi: 10.1155/2009/365785.
13. Aleid AA. Tissue Engineering: An Analogous Platelet Rich Fibrin for Coronal Pulpotomy in Revival of Pulp Tissue Vitality in Adult Molar with Pulpitis, a Case Report. Int J Dent Sci Res. 2018; 6(3): 78-82. Doi: 10.12691/ijdsr-6-3-5.
14. Patil PA, Kamatagi L, Patil J, Saraf P. Pulpotomy Using Platelet Rich Fibrin and Biodentinin: A Permanent Molar Tooth - A Case Report. IOSR J Dent Med Sci. 2017; 16(8): 38-41.
15. Singh R, Kavita K, Kommula A, Kulkarni G, Jois HS. To compare mineral trioxide aggregate, platelet-rich fibrin, and calcium hydroxide in teeth with irreversible pulpitis: A clinical study. J Pharm Bioallied Sci. 2020; 12(Suppl 1): S436-S439. doi: 10.4103/jpbs.JPBS_130_20.
16. Chai J, Jin R, Yuan G, Kanter V, Miron RJ, Zhang Y. Effect of liquid platelet-rich fibrin and platelet-rich plasma on the regenerative potential of dental pulp cells cultured under inflammatory conditions: a comparative analysis. J Endod. 2019; 45(8): 1000-1008. doi: 10.1016/j.joen.2019.04.002.
17. Schmalz G, Widbiller M, Galler KM. Clinical perspectives of pulp regeneration. J Endod. 2020; 46(9): S161-S174. doi: 10.1016/j.joen.2020.06.037.
18. Yoshpe M, Kaufman AY, Lin S, Ashkenazi M. Regenerative endodontics: a promising tool to promote periapical healing and root maturation of necrotic immature permanent molars with apical periodontitis using platelet-rich fibrin (PRF). Eur Arch Paediatr Dent. 2021; 22(3): 527-34. doi: 10.1007/s40368-020-00572-4.
19. Prasanthi NN, Simpsy GS, Chittem J, Sajjan GS. Biological Approach in the Management of Permanent Molars with Irreversible Pulpitis Using Platelet-Rich Fibrin as a Pulpotomy Medicament: Case Reports with 2-Year Follow Up. J Interdiscip Dentistry. 2018; 8(1): 30. doi: 10.4103/jid.jid_54_17.

AUTHOR AFFILIATION:

Dr. Ashique Hussain Sahito
Department of Operative Dentistry
Noor Dental Surgery and Aesthetic Clinic
Nawabshah, Sindh-Pakistan.

Dr. Saleem Raza Khuhawar
(Corresponding Author)
Associate Professor
Department of Oral Biology
Bibi Aseefa Dental College @ SMBBMU
Larkana, Sindh-Pakistan.
Email: oralbiologistsaleem@gmail.com

Prof. Abdul Latif Jokhio
Department of Anatomy
Khairpur Medical College
Khairpur Mir's, Sindh-Pakistan.

Dr. Muhammad Rafique Tagar
Associate Professor
Biochemistry BADC
SMBBMU, Larkana, Sindh-Pakistan.

Dr. Mushtaque Ahmed Shaikh
Department Operative Dentistry
KMC Civil Hospital Khairpur, Sindh-Pakistan.

Dr. Mujeeb Rehman Kalwar
Senior Dental Surgeon Dental Department
Liaquat University Hospital
Hyderabad, Sindh-Pakistan.

Original Article

Frequency of Dyslipidemia in Patients with Lichen Planus: A Comparative Cross-Sectional Study

Sana Khan, Muhammad Suleman Pirzado, Hafiz Bashir Ahmed Kalhoro, Nadia Rajper, Sikander Munir Memon, Faryal Hussain Memon

ABSTRACT

OBJECTIVE: To determine the relationship between lichen planus (LP) and dyslipidemia.

METHODOLOGY: It was a comparative cross-sectional study conducted at the department of dermatology, Liaquat University of Medical & Health Sciences, Hyderabad, from October 2016 to April 2017. The study included both genders aged 20 to 50, including all patients with cutaneous lichen planus of more than one month. Each patient's blood sample (after 8 hours of fasting) was collected and sent to the LUMHS diagnostic and research laboratory for lipid profile (elevated total cholesterol higher than 200mg/dL and elevated LDL-C higher than 130mg/dL in LP patients). Where a consultant pathologist prepared each report (at least three years of post-fellowship experience), and the presence or absence of dyslipidemia was noted. All of these data were recorded on a specially designed pro forma.

RESULTS: Mean age was 31.23±7.27 years. Out of 100 patients, 51 (51.0%) were male and 49 (49.0%) were females with a ratio of 1:1 between males and females. dyslipidemia in A-group was seen in 35 (70.0%) patients while in B-group was seen in 18 (36.0%) patients (p-value = 0.001 and odds ratio = 4.1481).

CONCLUSION: This study concluded that the frequency of dyslipidemia is higher in lichen planus patients compared to healthy individuals.

KEYWORDS: Lichen Planus, Cholesterol, Dyslipidemia, Dermatology

This article may be cited as: Khan S, Pirzado MS, Kalhoro HBA, Rajper N, Memon SM, Memon FH. Frequency of Dyslipidemia in Patients with Lichen Planus: A Comparative Cross-Sectional Study. J Liaquat Uni Med Health Sci. 2022;21(02):121-5.
doi: 10.22442/jlumhs.2021.00826. Epub 2021 May 08.

INTRODUCTION

Lichen planus (LP) is an autoimmune disease of chronic inflammation that affects the face, mouth, genital mucosa, scalp and nails. Six P's (planar, purple, polygonal, pruritus, papules and plaques) are used to identify LP lesions. Generally, the presentation is acute, and the flexor surfaces of wrists, forearms and legs are affected. Often the lesions show lacy, reticular, white lines called Wickham striae[1]. The exact cause of LP is not very clearly understood. It was found to be an immunologically mediated disease, and some triggers are clinically found to be responsible for it. There are obvious links with the facts, such as drugs, stress, environmental allergens, food allergens and systemic illness.

Dyslipidemias are disorders of lipoprotein metabolism, including the overproduction and deficiency of lipoproteins. Many dermatological disorders are known to be associated with dyslipidemia. Most of these are chronic inflammatory diseases, and the underlying mechanism may involve the secretion of pro-inflammatory cytokines. Studies have shown an increased frequency of dyslipidemia in skin disorders such as psoriasis, lichen planus, pemphigus, granuloma annulare, histiocytosis, and connective tissue disorders such as lupus erythematosus. It was established that lichen planus was associated with dyslipidemia[2,3]. Chronic inflammation can explain the association with dyslipidemia in patients with lichen planus. Studies have reported that individuals with lichen planus have significantly higher levels of various lipids compared to the control group[4]. Santiago AS et al.[11] revealed the higher dyslipidemia prevalence in lichen planus patients relative to the cases group, i.e. 61.3% vs 32.5%.

Epidermal cells in LP have demonstrated enzyme defects as well as impaired expression of the carbohydrate. Among patients living with LP, there was an increased incidence of diabetes and resistance to carbohydrates, indicating their possible role in the pathogenesis[4]. Oral LP was also diabetes-related[5,6]. However, not all research found similar results: the prevalence of systemic diseases such as hypertension (21%), arthritis (14%) and diabetes (5%) was not higher than projected in the general population in a single report[7]. Very few studies investigated the connection between LP and dyslipidemia to our knowledge.

Received: ***26-11-2020***
Revised: ***20-04-2021***
Accepted: ***21-04-2021***
Published Online: ***08-05-2021***

It may help screen lipid levels in men or women with lichen planus in detecting people at risk to launch preventive therapy against cardiovascular disease[2,8]. The study's objective was to determine the relationship of lichen planus (LP) with dyslipidemia. The rationale for this study was to assess the association between lichen planus and dyslipidemia in our local population. Although its association was already known, very few local studies on this subject have been found in our setting; this study will provide local statistics on the problem and be a valuable addition to existing literature. Also, based on these results, the high-risk patients can be given special attention. A proper screening protocol can be designed to screen lipid levels in lichen planus patients, which will help the clinicians make many concrete considerations in our guidelines for routine practice, treating dyslipidemia in these particular patients to reduce their morbidity and cardiovascular diseases.

METHODOLOGY

It was a comparative cross-sectional study conducted at the department of dermatology, Liaquat University of Medical & Health Sciences, Hyderabad, from October 2016 to April 2017. The calculated sample size was 100, i.e. 50 in each group with a 95% confidence level, 80% power of the study, taking a percentage of dyslipidemia in the A-group as 61.3% and in the B-group as 32.5%.[9] Non-probability, consecutive sampling was used. The ethical approval was taken from the College of Physicians & Surgeons of Pakistan. All patients with cutaneous lichen planus of more than one-month duration, both genders aged between 20-50 years were included in the study.

The exclusion criteria for the study were patients with oral lichen planus (lichen planus in the oral cavity), pregnancy and lactation (urine pregnancy test for women of childbearing age), patients with psoriasis (assessed on clinical examination, i.e. chronic erythematous scaly plaques (raised areas of inflamed skin covered with silvery-white scaly skin), hepatitis and chronic liver disease (assessed on history and s/ bilirubin higher than 1.0mg/dL), renal disease (renal function test, creatinine higher than 1.1mg/dL), the lichenoid reaction caused by some drug or dental amalgam (history of drug intake before the appearance of lesion or any dental procedure) and patients not willing to be included in the study.

Written informed consent from the patients was obtained. Fifty subjects who were presented to the department of dermatology, Liaquat University of Medical & Health Sciences, Hyderabad, fulfilling the inclusion criteria and 50 attendants of the patients that were similar in demographic characteristics, i.e. age, gender, height, weight, BMI and socioeconomic status, were selected.

Each patient's blood sample (after 8 hours of fasting) was collected and sent to the LUMHS diagnostic and research laboratory for lipid profile (elevated total cholesterol higher than 200mg/dL and elevated LDL-C higher than 130mg/dL in LP patients). Where a consultant pathologist prepared each report (at least three years of post-fellowship experience), and the presence or absence of dyslipidemia was noted. All of these data have been recorded on a specially designed pro forma.

Statistical analysis was carried out using version 22.0 of SPSS. Results for quantitative variables, i.e. age, period of disease and index of body mass (BMI), were reported as mean and standard deviation. For qualitative variables such as gender, diabetes, hypertension, obesity and dyslipidemia (Present/ Absent), frequency and percentage were measured.

Effect modifiers such as age, disease duration, gender, diabetes mellitus (Yes/No), hypertension (Yes/No), and obesity (Yes/No) have been controlled by stratification and post-stratification. Chi-square was applied to determine their effect on outcome, and P-value less than or equal 0.05 was considered significant. The adjusted odds ratio was also calculated.

RESULTS

The age range in this study was 31.23±7.27 years, from 20-50 years of age. The mean age of A-group patients was 30.76±6.87 years, and 31.72±7.69 years in B-group. Subjects aged between 20 and 50 years.

Of 100 patients, 51(51.0%) were males and 49 (49.0%) were females (**Table I**). The mean disease period was 4.33 ± 2.08 months. The mean BMI was 29.54 ± 4.41 kg/m^2.

Dyslipidemia in A-group was seen in 35 (70.0%) patients 18 (36.0%) patients were seen in the B-group. Stratification of age-related dyslipidemia was shown in **Table II**. This result showed significant variations in dyslipidemia between the two groups of 20 and 35 years of age.

Dyslipidemia stratification concerning disease duration is shown in **Table III**. Dyslipidemia stratification for diabetes mellitus, obesity (BMI), and hypertension have been displayed in **Table IV**.

TABLE I: DISTRIBUTION OF PATIENTS ACCORDING TO DYSLIPIDEMIA IN BOTH GROUPS

		A-group (n=50)		B-group (n=50)	
		No. of Patients	%	No. of Patients	%
Dyslipidemia	Yes	35	70.0	18	36.0
	No	15	30.0	32	64.0
Obesity (BMI)	Yes	23	46.0	25	50.0
	No	27	54.0	25	50.0
HTN	Yes	20	40.0	18	36.0
	No	30	60.0	32	64.0

The P-value is statistically significant at 0.001.
The odds ratio is statistically significant at 4.148.

TABLE II: STRATIFICATION OF AGE-RELATED DYSLIPIDEMIA

Age of patients (years)	A-Group (n=50)		B-group (n=50)		P-value
	Dyslipidemia		Dyslipidemia		
	Yes	no	yes	no	
20-35	28 (80.0%)	07 (20.0%)	11 (34.38%)	21 (65.62%)	0.001
36-50	07 (46.67%)	08 (53.33%)	07 (38.89%)	11 (61.11%)	0.653
Gender					
Male	17 (73.91%)	06 (26.09%)	10 (35.71%)	18 (64.29%)	0.008
Female	18 (66.67%)	09 (33.33%)	08 (36.36%)	14 (63.64%)	0.037

TABLE III: DYSLIPIDEMIA STRATIFICATION CONCERNING THE DURATION OF THE DISEASE

Duration of disease (months)	A-Group (n=50)		B- group (n=50)		P-value
	Dyslipidemia		Dyslipidemia		
	yes	no	yes	no	
≤5 months	26 (76.47%)	08 (23.53%)	10 (30.30%)	23 (69.70%)	0.000
>5 months	09 (56.25%)	07 (43.75%)	08 (47.06%)	09 (52.94%)	0.527

TABLE IV: STRATIFICATION OF DYSLIPIDEMIA CONCERNING DIABETES MELLITUS

Diabetes mellitus	A-Group (n=50)		B- group (n=50)		P-value
	Dyslipidemia		Dyslipidemia		
	yes	no	yes	no	
Yes	16 (76.19%)	05 (23.81%)	11 (44.0%)	14 (56.0%)	0.031
No	19 (65.52%)	10 (34.48%)	07 (28.0%)	18 (72.0%)	0.007
Hypertension					
Yes	11 (61.11%)	07 (31.89%)	07 (35.0%)	13 (65.0%)	0.112
No	24 (75.0%)	08 (25.0%)	11 (36.67%)	19 (63.33%)	0.003
Obesity					
Yes	16 (69.57%)	07 (30.43%)	11 (44.0%)	14 (56.0%)	0.078
No	19 (70.37%)	08 (29.63%)	07 (28.0%)	18 (72.0%)	0.003

DISCUSSION

In some skin diseases, such as androgenetic alopecia[4,10] psoriasis, cardiovascular risk factors have been measured[11,12]. Although lipid abnormalities have been studied in LP, comparative cross-control studies on metabolic syndrome components in LP are limited. Some studies in cases of LP proved this association, as inflammation triggers lipid metabolism disorders such as increased serum triglycerides (TG) or lower lipoprotein cholesterol (HDL-C) levels. Such lipid disorders associated with chronic inflammation lead to an increase in the risk of cardiovascular dyslipidemia. Chronic inflammation may be associated with dyslipidemia in LP patients. Lipid level screening may be helpful for men or women with LP to detect people at risk and initiate preventive treatment against cardiovascular disease development[13]. Santiago SA et al.[11] reveal the higher Dyslipidemia prevalence in lichen planus patients compared to the B-group, i.e. 61.3% vs 32.5%.

Twenty-eight cases were males in another study[15], and 22 cases were females. Patient ages ranged between 19 years and 78 years. The mean age was 41.71 for LP males and 40.64 for lichen planus females. In patients with LP, the frequency of dyslipidemia was 38% in cases and 6% in controls[15]. Panchal F 2015[17] observed statistically significantly higher levels of TC, TG, and LDL-C and a decline in HDL-C levels in LP patients relative to their controls.

In a study, the prevalence of abnormally elevated total cholesterol (>200mgldl) was significantly elevated in LP patients vs healthy controls (53% of LP and 15% of control) ($x2=8.32$, $p<0.05$) and the prevalence of abnormally elevated LDL-C (>130mgldl) was highly significantly elevated in LP patients vs healthy controls (86.7% of LP and 10% of control) ($x2 = 42.92$, $p= <0.001$)[17].

A mean total cholesterol level of normal healthy control in Pakistan is reported as 190.06 mg/dL[20]. The total cholesterol level in Europe's whole population is 210.82 mg/dL[19]. Oral mucosal LP is more associated with dyslipidemia[20], and metabolic syndrome is mainly associated with the oral type of LP. At the same time, triglyceride is significantly associated with hypertrophic LP but also showed an increase in other lipid profile parameters but not significant[21].

Various pathways clarified the link between inflammation and dyslipidemia: Modulating lipoprotein lipase (LPL) enzymatic activity by anti-LPL antibodies and decreased LPL activity due to various pro-inflammatory cytokines such as tumor necrosis factor, interleukin-1, interleukin-6, and monocyte protein-1 and interferon chemo-attractant. In addition, atherogenic autoantibodies complexes to oxidize LDL and oxidized anti-cardiolipin are generated in response to inflammatory oxidation. It increases LDL deposition in the endothelial wall[22].

The clinical study of plasma lipids in patients with LP should be conducted not only for diagnosis and treatment but also for prevention, considering that atherosclerotic lesions begin to occur at an early age and intensify in the presence of other risk factors. To set priorities for intervention in dyslipidemia patients the risk of CV must be stratified. Dyslipidemia and

other risk factors such as kidney diseases, diabetes, smoking, and arterial hypertension are common and significantly enhance CV events. Initiatives to establish evidence to support the hypothesis of dyslipidemia in patients with LP could lead to the possibility of assessing CV risk[23].

CONCLUSION

This study concluded that the frequency of dyslipidemia is higher in lichen planus patients compared to the healthy group.

Ethical permission: College of Physicians & Surgeons Pakistan REU permission letter No. CPSP/ REU/DER-2015-164-562, dated 23-6-2018.

Conflict of Interest: There is no conflict of interest among the authors

Funding: It was a self-funding project.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Khan S: Concept and design
Pirzado MS: Data interpretation, drafting of the article
Kalhoro HBA: Intellectual content
Rajpar N: Collection and assembly of data
Memon SM: Analysis, Statistical expertise
Memon FH: Final Proofreading

REFERENCES

1. Alrashdan MS, Cirillo N, McCullough M. Oral lichen planus: a literature review and update. Arch Dermatol Res. 2016; 308(8): 539-51. doi:10.1007/ s00403-016-1667-2.
2. Sharaf A, Zaki NS, Kadry D, Rashed L, Awad MA. Levels of osteopontin in plasma and tissue in relation to metabolic status in patients with lichen planus. J Egypt Women's Dermatologic Soc. 2017; 14(3): 173-8. doi: 10.1097/01.EWX.000052 6123.98579.b2
3. Garcia-Pola MJ, Llorente-Pendás S, Seoane-Romero JM, Berasaluce MJ, García-Martín JM. Thyroid Disease and Oral Lichen Planus as Comorbidity: A Prospective Case-Control Study. Dermatology. 2016; 232(2): 214-9. doi: 10.1159/ 000442438.
4. Powell SM, Ellis JP, Ryan TJ, Vickers HR. Glucose tolerance in lichen planus. Br J Dermatol. 1974; 91(1): 73–5. doi: 10.1111/j.1365-2133.1974. tb06719.x.
5. Tavangar A, Ghalayani P, Boroujeni M, Ghoreishian F. Salivary levels of interleukin-8 in oral lichen planus and diabetic patients: A biochemical study. Dent Res J (Isfahan). 2017; 14 (3): 209-14. doi: 10.4103/1735-3327.208771.
6. Morgado-Carrasco D, Combalia A, Fustà-Novell X, Mascaró Jr J, Iranzo P. Aggressive erosive lichen planus associated with hepatitis C responding to sofosbuvir/ledipasvir treatment. Indian J Dermatol Venereol Leprol. 2019; 85(3): 326-9. doi: 10.4103/ijdvl.IJDVL_225_18.
7. Kaomongkolgit R, Daroonpan P, Tantanapornkul W, Palasuk J. Clinical profile of 102 patients with oral lichen planus in Thailand. J Clin Exp Dent. 2019; 11(7): e625-e629. doi: 10.4317/jced.55814.
8. Shenoy C, Shenoy M, Rao G. Dyslipidemia in dermatological disorders. N Am J Med Sci. 2015; 7(10): 421-428. doi: 10.4103/1947-2714.168657.
9. Arias-Santiago S, Buendía-Eisman A, Aneiros-Fernández J, Girón-Prieto MS, Gutiérrez-Salmerón MT, García-Mellado V et al. Lipid levels in patients with lichen planus: a case-control study. J Eur Acad Dermatol Venereol. 2011; 25 (12): 1398-401. doi: 10.1111/j.1468-3083.2011. 03983.x.
10. Kar BR, Panda M, Patro N. Metabolic derangements in lichen planus - A case control study. J Clin Diagnostic Res. 2016; 10(11): WC01 -WC03. doi: 10.7860/JCDR/2016/21993.8818.
11. Diop A, Ly F, Ndiaye MT, Seck B, El Omari A, Diouf A et al. Epidemiology, clinical features, and associated factors in 78 cases of lichen planus on black skin. Int J Dermatol. 2020; 59(2): 137-42. doi: 10.1111/ijd.14698.
12. Otero Rey EM, Yáñez-Busto A, Rosa Henriques IF, López-López J, Blanco-Carrión A. Lichen planus and diabetes mellitus: Systematic review and meta-analysis. Oral Dis. 2019; 25(5): 1253-64. doi: 10.1111/odi.12977.
13. Balasubramaniam P, Ogboli M, Moss C. Lichen planus in children: review of 26 cases. Clin Exp Dermatol. 2008; 33(4): 457-9. doi: 10.1111/j.1365-2230.2008.02694.x.
14. Ozlu E, Karadag AS, Toprak AE, Uzuncakmak TK, Gerin F, Aksu F et al. Evaluation of Cardiovascular Risk Factors, Haematological and Biochemical Parameters, and Serum Endocan Levels in Patients with Lichen Planus. Dermatology. 2016; 232(4): 438-43. doi: 10.1159/000447587.
15. Panchal F, Ray S, Munshi R, Bhalerao S, Nayak C. Alterations in lipid metabolism and antioxidant status in lichen planus. Indian J Dermatol. 2015; 60(5): 439-444. doi: 10.4103/0019-5154.159624.
16. Bakr HG, Eldesouky F, Esawy AM, El-Alawi SM. Assessment of Dyslipidemia and Other Cardiovacular Risk Factors in Patients With Mycosis Fungoides and Lichin Planus. Int J Sci Res. 2016; 5(8): 72-6.
17. Santos VGF, Bertuzzi R, Franchini E, Silva-cavalcante marcos david da, Kiss maria augusta pedulti dai molin, Lima-Silva AE. Relationship Between Attack and Pause in World Taekwondo Championship Contests: Effects of Gender and

Weight Category. Muscles Ligaments Tendons J. 2014; 4(2): 127-31.
18. Hanif S, Akhtar B, Afzal MN. Serum Lipoprotein (a) levels in acute coronary syndrome; Comparison of younger and elderly patients with healthy controls. Pak J Med Sci. 2019; 35(6): 1718-23. doi: 10.12669/pjms.35.6.377.
19. Redon P, Maloberti A, Facchetti R, Redon J, Lurbe E, Bombelli M et al. Gender-related differences in serum uric acid in treated hypertensive patients from central and east European countries: findings from the blood pressure control rate and cardiovascular risk profile study. J Hypertens. 2019; 37(2): 380-8. doi: 10.1097/HJH.0000000000001908.
20. Ying J, Xiang W, Qiu Y, Zeng X. Risk of metabolic syndrome in patients with lichen planus: A systematic review and meta-analysis. Nardone B, editor. PLoS One. 2020; 15(8): e0238005.
21. Lai YC, Yew YW, Schwartz RA. Lichen planus and dyslipidemia: a systematic review and meta-analysis of observational studies. Int J Dermatol. 2016; 55(5): e295-304. doi: 10.1111/ijd.13234.
22. Vinker Shuster M, Gendelman O, Tiosano S, Comaneshter D, Cohen AD, Amital H. Ischemic heart disease and ankylosing spondylitis-assessing the role of inflammation. Clin Rheumatol. 2018; 37(4): 1053-8. doi: 10.1007/s10067-018-4037-y.
23. Schwingshackl L, Strasser B, Hoffmann G. Effects of Monounsaturated Fatty Acids on Cardiovascular Risk Factors: A Systematic Review and Meta-Analysis. Ann Nutr Metab. 2011; 59(2-4): 176-86. doi: 10.1159/000334071.

AUTHOR AFFILIATION:

Dr. Sana Khan
Department of Dermatology
Liaquat University of Medical & Health Sciences
(LUMHS), Jamshoro, Sindh-Pakistan.

Dr. Muhammad Suleman Pirzado
Assistant Professor
Department of Molecular Biology and Genetics Laboratory
LUMHS, Jamshoro, Sindh-Pakistan.

Dr. Hafiz Bashir Ahmed Kalhoro
Assistant Professor
Department of Dermatology
LUMHS, Jamshoro, Sindh-Pakistan.

Dr. Nadia Rajper
Department of Dermatology
LUMHS, Jamshoro, Sindh-Pakistan.

Dr. Sikander Munir Memon *(Corresponding Author)*
Research Officer, Medical Research Center
LUMHS, Jamshoro, Sindh-Pakistan.
Email: drsikandermemon@gmail.com

Dr. Faryal Hussain Memon
Department of Dermatology
LUMHS, Jamshoro, Sindh-Pakistan.

Original Article

Significance of Various Diagnostic Methods for the Detection of Helicobacter Pylori Infection

Rasheed Ahmed Soomro, Muhammad Kaleem, Riaz Ahmed Qazi, Faisal Irshad, Mehwish Zafar, Moin-ul-Islam

ABSTRACT

OBJECTIVE: To determine the diagnostic significance of Helicobacter pylori (H. pylori) infection by histological examination of tissues and rapid Immunochromatographic assay from stool samples.

METHODOLOGY: This retrospective comparative study was performed in the Departments of Pathology and Medicine, Suleman Roshan Medical College Tandoadam, from August to December 2020, on one hundred cases collected by consecutive nonprobability technique, of any sex and age, having a clinical opinion of H pylori disease. Samples were collected, and gastric endoscopic biopsies were performed in all cases in the department of Medicine and shifted to the Pathology department for registration and processing. The rapid Immunochromatographic assay of the same patients was also performed to isolate H. pylori from faecal samples. All the data collected were statistically analyzed using SPSS 20, and the results were tabulated.

RESULTS: On histological examination, H. pylori bacilli were detected in 90 (90%) patients, of which the male was 52(57.7 %). The age ranges from 14 - 85 years, with a mean of 47.9. The histopathologically positive cases were compared with stool antigen, and H. pylori antigen in stool were isolated on immunochromatography technique in 48 (48%) subjects. The sensitivity and specificity of stool antigen were 52.74% and 90%, respectively, and the P-value was 0.011.

CONCLUSION: H. pylori positivity is highly significant in histological examination of endoscopic gastric biopsies and may be identified by stool analysis as seen in this study which is noninvasive, most straightforward and has low expenses.

KEY WORDS: H. pylori, Endoscopic Gastric Biopsies, Histological Examination, Stool Antigen

This article may be cited as: Soomro RA, Kaleem M, Qazi RA, Irshad F, Zafar M, Moin-ul-Islam. Significance of Various Diagnostic Methods for the Detection of Helicobacter Pylori Infection. J Liaquat Uni Med Health Sci. 2022;21(02):126-30.
doi: 10.22442/jlumhs.2022.00916. Epub 2022 May 10.

INTRODUCTION

Significant attention occurs in the learning of gastric microbiology after detecting spiral-like organisms 'Campylobacter' isolated from the specimens of biopsy from gastric antrum[1]. The gastric mucosa harbour colonies of H. pylori in almost every fourth of the adult population[2]. It is documented that there was uncertainty regarding the anticipated part of H. pylori infection in the causation of chronic active gastritis and peptic ulcer disease[3].

H. pylori organisms are worldwide concerned in the pathogenesis of acid peptic disease[4]; there is universal dissemination along with an elevated frequency in unindustrialized countries within elderly persons, and is fundamental with chronic active antral gastritis and is highly linked with duodenal and gastric ulcers[5]. It may persist in the acidic gastric setting by the enzyme urease, which transforms urea into ammonia and carbon dioxide, empowering it to neutralize the acid in its close environment[6].

It is considered that the H. pylori infection is prevalent throughout the world, but about 70% of sufferers are asymptomatic. About 50% of symptomatic cases comprise peptic ulcer disease, lymphoproliferative disorders, and gastric carcinoma. The involved patients suffer from duodenal ulcers, while other shows develop gastric ulceration and have altered frequency of infection in unindustrialized and industrialized nations[7]. Various invasive and noninvasive methods nowadays exist to detect H. pylori infection[8]. The invasive procedure includes culture, microscopic evaluation, urease testing and endoscopic biopsy from suspected areas[9].

The invasive procedures are tiresome and time-consuming and need a specimen process resulting in patient discomfort[10]. H. pylori are a delicate bacterium and so smashed during transportation[11]. The noninvasive methods are urea breath test needs ingestion of carbon isotope urea derivate[4], and recognition of serum antibodies to H. pylori serologically[12].

Received: ***13-09-2021***
Revised: ***16-03-2022***
Accepted: ***19-04-2022***
Published Online: ***10-05-2022***

METHODOLOGY

This retrospective comparative work was performed in the Pathology and Medicine department, Suleman Roshan Medical College Tando Adam, from August to December 2020, on one hundred cases collected by consecutive nonprobability technique, having a clinical opinion of H pylori infection**.** Patients included were cases of all ages and sex having symptoms of dyspepsia or clinically suspected cases of H. pylori associated gastritis. Cases having complete denudated or ulcerated mucosa or samples having autolytic effects. Patients with a history of using non-steroidal anti-inflammatory drugs (NSAIDs) or extirpate treatment were omitted from the study.

A structured proforma was formatted for the study, collecting all the demographic and clinical information. Endoscopists also noted clinical judgments and appropriate data of all the cases and patients. The current study compares the following approaches for recognizing H. pylori infection with specificity and sensitivity.

1. Gastric endoscopic, microscopic examination by H & E and Giemsa stain
2. Rapid Immunochromatographic assay: isolation of H. pylori antigen from faecal material

RESULTS

Among 100 cases of gastric biopsy, H. pylori bacilli were detected microscopically in 90(90%) cases while examined under a microscope using H & E and Giemsa stains. These comprise 52(57.7 %) males and 38(42.3 %) females. The age of the study population ranged from 14 to 85 years, with a mean of 47.9 (**Table I**).

The fresh faecal specimen was obtained from 100 cases in a sterilized container; the H. pylori antigen was isolated by immunochromatography and confirmed in 48(48%) subjects. The stool antigen was detected in 28(58.3%) males (**Table II**). The specificity and sensitivity of stool antigen were 52.74% and 90%, respectively and the P-value detected was 0.011.

Table III shows the results of 100 gastric biopsies on Stool Analysis to detect H pylori. Among 90 positive cases of H pylori, 47(52.22%) cases showed HpSA positive, while 43(47.78%) showed HpSA negative. Out of 10 negative cases of H pylori, 01(10.0%) cases showed HpSA positive, while 09 (90%) cases showed HpSA negative.

Table IV shows the Sensitivity and Specificity of the H pylori stool antigen test. The sensitivity of the H pylori antigen test was found to be 52.22%, while specificity was found to be 90%.

TABLE III:
RESULTS OF 100 GASTRIC BIOPSIES ON STOOL ANALYSIS FOR ISOLATION OF H. PYLORI

Gastric biopsies on H&E & Giemsa stain	No of cases	Pos-itive	Percent (%)	Neg-ative	Percent (%)
HpSA positive	90	47	52.22%	43	47.78%
HpSA Negative	10	01	10.00%	09	90%

TABLE IV: SENSITIVITY AND SPECIFICITY OF H. PYLORI STOOL ANTIGEN TEST

HpSA	Positive	Negative
Positive	(a) 47	(b) 01
Negative	(c) 43	(d) 09

Sensitivity = a/(a+c)×100 = 52.22% Specificity = d/ (d+b)×100 = 90%

TABLE I: ANALYSIS OF GASTRIC BIOPSIES REGARDING AGE & SEX

Gastric biopsies Analysis	Male				Female				Grand Total
Age Group	14-32	33-64	65-85	Total	14-32	33-64	65-85	Total	
Positive +++	02	03	00	05	01	02	00	03	08
Positive ++	01	02	00	03	01	04	00	05	08
Positive +	20	21	03	52	08	22	00	38	74
Negative	00	04	00	04	02	04	00	06	10
Total	23	30	03	56	12	32	00	44	100

+=Low, ++=Medium , +++=Higher

TABLE II: H. PYLORI STOOL ANTIGEN TEST WITH AGE AND SEX (n=100)

H. pylori Stool Antigen	Male				Female				Grand Total
Age Group	14-32	33-64	65-85	Total	14-32	33-64	65-85	Total	
Positive	11	16	1	28	6	14	0	20	48
Negative	12	14	2	28	6	18	0	24	52
Total	23	30	3	56	12	32	0	44	100

FIGURE I: MICROPHOTOGRAPH SHOWING HELICOBACTER PYLORI, (ARROW) ON H & E STAIN

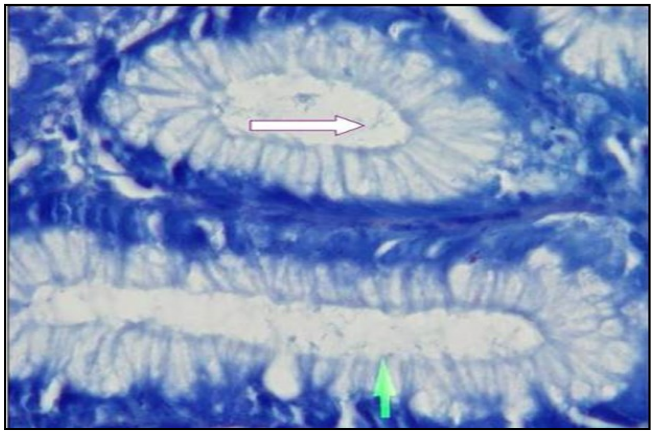
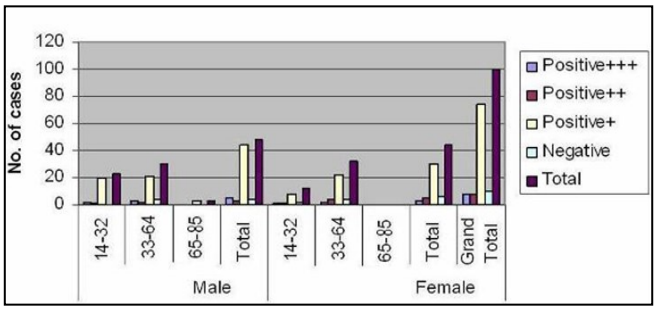


FIGURE II: CHROMATOGRAPHS SHOW STOOL ANTIGEN POSITIVE BY RAPID IMMUNOCHROMATOGRAPHY

GRAPH: GASTRIC BIOPSY SAMPLES IN TERMS OF AGE & SEX



DISCUSSION

Over the past 52 years of the history of endoscopy, it has been broadly merged to identify upper GIT conditions[13]. The main explanation for the execution of endoscopic examination is to detect the underlying ulcer disease. The noninvasive investigations for H. pylori have proved to be a valuable prognosticator for endoscopic judgment in managing dyspepsia[14]. For the isolation of H. pylori, the culture is thought to be a gold standard technique. However, it focuses on inaccuracy in the storage and handling of the sample, so histological testing is believed to be the gold standard in identifying H. pylori contamination. The biopsy process depends on inaccuracy as the infection is in patches and afterwards incompletely effective abolition, low-level contamination can be missed on biopsy[15].

In our study, out of 100 cases, 90 (90%) cases of gastric biopsies were labelled positive for H. pylori organisms, and the remaining 10 (10%) cases were negative; this finding attested to the results of previous national and international studies which detected 93.8% and 90% of positive cases respectively[16,17], while one national study revealed a result of 64% due to unknown reason[15]. Another study conducted on endoscopic biopsies of 63 patients showed 87% positive cases for H. pylori on Giemsa stain[18].

Although our study coincides with the research mentioned above, more significant and specific than these, it may be due to more expertise of gastroenterologists performing endoscopic procedures, locating the proper area for a biopsy on one side and education of patients to approach gastroenterologists for their better and early treatment on other side.

In our research, among 90 positive cases, 52 (57.7%) were male. There is a slight variation of results in other studies, like other workers who found 52.2% and 66.6% male cases in their studies[16,17]. The reason for the involvement of more male populations requires further research.

Endoscopic biopsy for histopathological examination is essential for identifying H. pylori organisms. Although it is an invasive, expensive, and inconvenient procedure, it is still considered and proved the gold standard technique for isolating H. pylori infection.

In our study, stool examination was performed on 100 cases to recognize the antigen. Among 90 (90%) histopathologically positive cases, 47 (52.22%) were positive on the immunochromatography process. Among ten histologically negative cases for infection, we confirm only 01 cases were positive, and 09 samples were negative. The positivity may be due to selecting an improper site for biopsy by an endoscopist; in contrast, a high positivity ratio of 60% and 79.59% is documented in the literature[19,20]. The lesser number of positive subjects in our study may be because of the inadequate number of antigens in the stools.

CONCLUSION

In our study, H. pylori positivity is highly significant in the histological examination of endoscopic biopsies on H&E and Giemsa Stains. It is still to be proved a more reliable and gold standard method for diagnosing H. pylori. It will be more helpful if gastric biopsies should be taken from the proper site and multiple biopsies by endoscopists as gastritis is a patchy inflammatory disease. In this position, the case may be detected by serum or stool analysis, which are noninvasive, most straightforward and least expensive methods.

Ethical Permission: Suleman Roshan Medical College Tando Adam Sindh approval letter dated 11-08-2021.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: There was no funding agency used for this research.

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Soomro RA: Main idea and conception
Kaleem M: Collection and acquisition of data, analysis of data
Qazi RA: Design, interpretation of data
Irshad F: Analysis and interpretation of results
Zafar M: Compilation and finalizing of manuscript
Ul-Islam M: Critical review of manuscript, reference collection

REFERENCES

1. Sabbagh P, Mohammadnia-Afrouzi M, Javanian M, Babazadeh A, Koppolu V, Vasigala VR et al. Diagnostic methods for Helicobacter pylori infection: ideals, options, and limitations. Euro J Clin Microbio Infect Dis. 2019; 38(1): 55-66. doi: 10.1007/s10096-018-3414-4.
2. Karkhah A, Ebrahimpour S, Rostamtabar M, Koppolu V, Darvish S, Krishna Rekha et al. Helicobacter pylori evasion strategies of the host innate and adaptive immune responses to survive and develop gastrointestinal disease. Microbiol Res. 2019; 218: 49-57. doi: 10.1016/j.micres. 2018.09.011.
3. Forbes KJ, Fang Z, Pennington TH. Allelic variation of the Helicobacter pylori flagellin genes flaA and flaB: its consequences for strain typing schemes and population structures. Epidemiol Infect.1995; 114(2): 257-266. doi: 10.1017/s09502 68800057927.
4. Kuna L, Jakab J, Smolic R, Raguz-Lucic N, Vcev A, Smoli M. Peptic Ulcer Disease: A Brief Review of Conventional Therapy and Herbal Treatment Options. J Clin Med. 2019; 8(2): 179.doi: 10.3390/ jcm8020179
5. Greenberg RE, Bank S. The prevalence of Helicobacter pylori in non-ulcer dyspepsia. Arch. Intern Med. 1990; 150: 2053-55. doi:10.1001/ archinte.1990.00390210049012.
6. Berger A. Scientists discover how helicobacter survives gastric acid. BMJ. 2000; 320(7230): 268.
7. Das JC, Paul N. Epidemiology and pathophysiology of Helicobacter pylori infection in children. Indian J Pediatr. 2007; 74(3): 287-290. doi: 10.1007/s12098-007-0046-6.
8. Hasosah M. Accuracy of invasive and noninvasive methods of Helicobacter pylori infection diagnosis in Saudi children. Saudi J Gastroentrol. 2019; 25 (2): 126-31. doi: 10.4103/sjg.SJG_288_18.
9. Al-Ezzy AI. Evaluation of Endoscopy based H. pylori Diagnostic Techniques in Iraqi Patients with upper Gastrointestinal Disorders. Indian J Sci Technol. 2016; 9(22): 1-10. DOI: 10.17485/ ijst/2016/v9i22/85384.
10. Abadi ATB. Diagnosis of Helicobacter pylori Using Invasive and Noninvasive Approaches. J Pathog. 2018; 2018: 9064952. doi: 10.1155/2018/9064952.
11. Saxena A, Mukhopadhyay AK, Nandi SP. Helicobacter pylori: Perturbation and restoration of gut microbiome. J Biosci. 2020; 45 (1): 110. doi: 10.1007/s12038-020-00078-7.
12. Lee A. Helicobacter pylori: causal agent in peptic ulcer, microbiological aspects. Gastroenterol Hepatol. 1991; 6(2): 115-120. doi: 10.1111/j.1440 -1746.1991.tb01449.x.
13. Teh J, Shabbir A, Yuen S, Bok-Yan So J. Recent advances in diagnostic upper endoscopy. World J Gastroenterol. 2020; 26(4): 433-447. doi: 10.3748/ wjg.v26.i4.433.
14. Moayyedi P, Lacy BE, Andrews CN, Enns RA, Howden CW, Vakil N. ACG and CAG Clinical Guideline: Management of Dyspepsia. Am J Gastroenterol. 2017; 112(7): 988-1013. doi: 10.1038/ajg.2017.154
15. Satti SA, Saeed F, Sarwar M. Comparison between serological testing and biopsy examination of helicobacter pylori. Pak Armed Forces Med J. 2004; 54(2): 195-8.
16. Tzeng JE, Lin YL, Chung SM, Chu YT. Comparison of four diagnostic method for Helicobacter pylori. Tzu Chi Med J. 2005; 17(5): 339-343.
17. Qureshi AF, Memon AS, Memon MA, Memon JM, Soomro AA, Shaikh MK. Incidence of Helicobacter pylori in gastrodudenitis. Biomedica. 1996; 12: 19-21.
18. Rotimi O, Cairns A, Gray S, Moayyedi P, Dixon MF. Histological identification of Helicobacter pylori comparison of staining methods. J Clin Pathol, 2000; 53(10): 756-9. doi: 10.1136/jcp.53. 10.756.
19. Chisholm SA, Watson CL, Teare EL, Saverymuttu

S, Owen RJ. Noninvasive diagnosis of Helicobacter pylori infection in adult dyspeptic patients by stool antigen detection: does the rapid immunochromatography test provide a reliable alternative to conventional ELISA kit. J Med Biol. 2004; 53(Pt 7): 623-7.

20. Gisbert JP, Trepero M, Calvet X, Mendoza J, Quesada M, Guell M et al. Evaluation of three different tests for the detection of stool antigens to diagnose Helicobacter pylori infection in patients with upper gastrointestinal bleeding. Aliment Pharmacol Ther. 2004; 19(8): 923-9. doi: 10.1111/ j.1365-2036.2004.01932.x.

AUTHOR AFFILIATION:

Dr. Rasheed Ahmed Soomro
(Correspondence Author)
Associate Professor, Department of Pathology
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.
Email: ralumhs@hotmail.com

Dr. Muhammad Kaleem
Assistant Professor, Department of Medicine
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.

Dr. Riaz Ahmed Qazi
Professor of Pathology
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.

Dr. Faisal Irshad
Associate Professor, Department of Pathology
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.

Dr. Mehwish Zafar
Assistant Professor, Department of Pathology
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.

Dr. Moin-ul-Islam
Assistant Professor, Department of Surgery
Suleman Roshan Medical College
Tando Adam, Sindh-Pakistan.

Original Article

Design and Development of a Mobile Application for the Control and Prevention of Viral Gastroenteritis as a Public Health Problem

Milad Zandi, Ismaeil Alizadeh, Saber Soltani, Mohebat Vali, Saeedeh Ebrahimi, Samaneh Abbasi

ABSTRACT

OBJECTIVE: This study aims to design and implement a mobile application, "Viral Gastroenteritis", and assess mobile users' satisfaction with this application.
METHODOLOGY: This study was conducted in February 2021 in two stages: designing and constructing a viral gastroenteritis disease application based on the Android system and investigating mobile users' satisfaction with this application.
RESULTS: Six hundred individuals responded to the questionnaire in this study; 36.5 % were males, 63.5 % were females, 35% were between 20-30 years old, and 43.83% had a bachelor's degree. The study results showed that more than 95% and 90% of the participants had no trouble installing the app. The images adequately conveyed the meaning of viral gastroenteritis, respectively.
CONCLUSION: According to the inquiry outcomes, this didactic software can increase users' awareness when facing viral gastroenteritis.

KEYWORDS: Viral gastroenteritis, Public health, Mobile application, Software, Rotavirus, Norovirus.

This article may be cited as: Zandi M, Alizadeh I, Soltani S, Vali M, Ebrahimi S, Abbasi S. Design and Development of a Mobile Application for the Control and Prevention of Viral Gastroenteritis as a Public Health Problem. J Liaquat Uni Med Health Sci. 2022;21 (02):131-5. doi: 10.22442/jlumhs.2022.00931. Epub 2022 April 28.

INTRODUCTION

Viral gastroenteritis is a common infectious disease syndrome and is a leading cause of significant morbidity from virals in young children and older people worldwide, especially in underdeveloped countries. Still, in developed countries, viral gastroenteritis is generally self-limiting, with a benign course, and recovery occurs during 2–5 days[1-3]. Treatment efforts have focused on reducing the days of diarrhea with adequate fluid, nutritional, and electrolyte therapy[4,5].

Two hundred million cases of diarrheal diseases occur annually worldwide, and an estimated 1.9 million children below five years of age die each year, mainly in developing countries[6,7].

Enteric viruses associated with acute diarrheal disease include Rotavirus, Norovirus, Adenovirus and Astrovirus[1,6,8]. There are several different forms of contact transmission, including dirty hands and food or water contaminated by human sewage (faecal-oral route), and airborne transmission has been proposed in recent decades[5].

Viral gastroenteritis starts suddenly with watery diarrhea and vomiting, often followed by varying combinations of headache, anorexia, myalgia, malaise, nausea, vomiting, abdominal cramps and low -grade fever[5,9].

Received: ***03-12-2021***
Revised: ***22-03-2022***
Accepted: ***06-04-2022***
Published Online: ***28-04-2022***

Viral gastroenteritis infection outbreaks most frequently occur during the cooler temperature with peak seasonality in winter. Climate seasonal may vary depending on the region[6,10].

Today, with the advancement and evolution of technology, mobile applications have significantly increased the knowledge of personal hygiene and public health awareness about the hazards of significant epidemics and the potential pandemic of viral infections. This study aimed to design and implement a mobile application, "Viral Gastroenteritis", and assess mobile users' satisfaction with this application. Our goal in designing this application is to inform the community about the dangers of viral gastroenteritis.

METHODOLOGY

Study design

This study was conducted in two stages. The first stage included the design and construction of a viral gastroenteritis disease application based on the Android system, and the second stage investigated the satisfaction of mobile users with this application

Design and construction of application

In the first step, software development is done in four stages, including:

1. Designing of the graphic template,
2. Collection of information associated with viral gastroenteritis from world health organization (WHO) and centres for disease control and prevention (CDC) guidelines,

3. Entering information taken into the graphic design template, and
4. Summarizing and the final design of the software were done.

The scientific contents of this educational app, which were associated with the essential viral agents that cause gastroenteritis, including Rotavirus, Norovirus, Adenovirus, and Astrovirus, were taken from WHO and CDC guidelines[7]. The graphic design template was coded, and the internal Android database (Roman database) was used for programming. The software overview was in XML language, and Java was used as the primary language for application software. This educational application was written with Android studio software version 3.6. The required contents and parts of this software, which included identification, prevention and control methods of Rotavirus, Norovirus, Adenovirus and Astrovirus infections, were entered into the graphic design template in batches in one step and separately. Finally, the software was developed and prepared for users.

Investigating the satisfaction of users

The second stage of this descriptive cross-sectional study was performed on 600 users yearly to evaluate their satisfaction with the application in 2020. Data collection tools in the second stage were done through an electronic questionnaire. In general, the questionnaire had questions related to demographic information and nine closed-ended questions (yes, no, to some extent) regarding the graphic and educational capabilities of the application contents. Here, there are two questions: "Do you prefer to use this application over reading texts?" and "How helpful was the application in the familiar with viral gastroenteritis disease?" options were given as "low, medium, high and very high". After installing the software, users were invited to participate in this study and were asked to complete the electronic questionnaire carefully. From an ethical point of view, the participants in the study were assured that their information would remain strictly confidential. The data obtained from this study were analyzed using descriptive statistics by SPSS software version 24.

RESULTS

In the present study, a viral gastroenteritis mobile application was designed for the Android system. The final design of the app pages is shown in **Figure I**. When the application is launched, the first page appears and shows attention "the contents of this program are for educational and awareness-raising purposes only and should not be considered medical advice". After approval by users, the main page, which includes the main menu, emerges; the main menu has four sections. One of these sections is "gastroenteritis," which provides information on the symptom, diagnostic, treatment, and vaccine of gastroenteritis. Another section is the "frequently asked questions in gastroenteritis with answer" section, enabling the users to get more information about gastroenteritis. In the next section, viruses that cause gastroenteritis, including rotaviruses, adenovirus, astrovirus, and norovirus, are classified, and every virus has unique information related to gastroenteritis. The contents of the third page are shown in **Figure I**. By clicking on any of the sections, the relevant page containing information and images appears. As shown in **Table I**, 600 individuals responded to the questionnaire in this study; 36.5 % were males, and 63.5 % were females. Moreover, 35% were between 20 and 30 years old, and 43.83% had bachelor's degrees. The demographic characteristics of the participants' responses have been described in **Table I**.

TABLE I: THE DEMOGRAPHIC DATA OF THE APPLICATION USERS

Characteristics	Number (%)
Gender	
Male	219(36.5)
Female	381(63.5)
Age group	
< 20 years old	52(8.66)
20-30	210(35)
30-40	146(24.33)
40-50	105(17.5)
> 50 years	87(14.5)
Education level	
High school	45(7.5)
Diploma	55(9.16)
Bachelor's degree	263(43.83)
Higher than a bachelor's degree	237(39.5)

Table II summarizes the participants' responses to the study questions, most of which were "Yes" and "Somewhat." The study results showed that more than 95% of the participants reported no troubles in the app installation and conceived the app size and speed as favorable. Furthermore, more than 90% of the participants reported that the app images adequately conveyed the meaning of Viral Gastroenteritis disease. Besides, more than 95% of the participants reported that the app's scientific content was up to date, and they could easily understand them.

The results also showed that 97% of users had no trouble using the application or contacting the developers. Moreover, 92% of the participants answered yes to "what is your first impression about this software?" and scored 4.5/5 on the question "How

TABLE II: THE RESPONSES OF THE PARTICIPANTS TO USER SATISFACTION QUESTIONS

Question	Yes	No	Somewhat
	Number (%)	Number (%)	Number (%)
Did you find the size of the application adequate?	580(96.66)	15(2.5)	5(0.83)
Did you have any trouble installing the application?	572(95.33)	20(3.33)	8(1.33)
Could you realize what message the images conveyed?	583(97.16)	10(1.66)	7(1.16)
Was the application's design (i.e., size, font, color, and brightness) favorable to you?	592(98.66)	5(0.83)	3(0.5)
Could the application convey its scientific message easily?	575(95.83)	20(3.33)	5(0.83)
Did you have any trouble using the application?	589(98.16)	8(1.33)	3(0.5)
Were you pleased with the speed and smoothness of the application?	573(95.5)	20(3.33)	7(1.16)
Did you find the information provided in the application up to date?	596(99.33)	3(0.5)	1(0.16)
Did you have any trouble contacting the app developers?	586(97.66)	10(1.66)	4(0.66)

FIGURE I: AN OVERVIEW OF THE MAIN PAGES IN THE PROPOSED APPLICATION

FIGURE II: THE RESULTS OF USER PREFERENCE BETWEEN USING THE APPLICATION AND READING PHYSICAL TEXTS

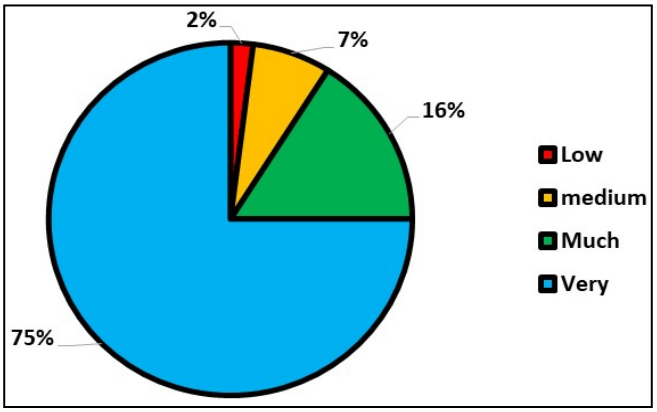
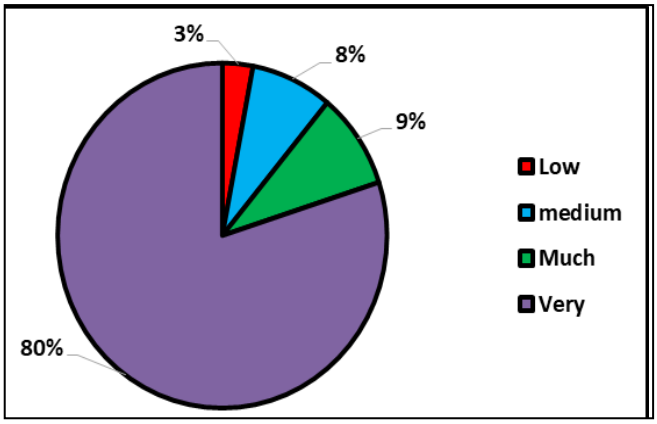


FIGURE III: THE RESULTS OF USERS' OPINIONS REGARDING THE EFFECTIVENESS OF THE APP'S SCIENTIFIC DATA IN IMPROVING THE DISEASE



innovative do you think this software is?"

There were some suggestions and limitations; the participants suggested that the developers add some videos related to the Viral Gastroenteritis on the app and provide an IOS version. Also, some could not install the application on their phones due to an outdated OS (Android 4 and below).

Figures II and III summarize the responses to the following questions: (1) How preferable is this application for you in reading over physical texts? (2)

How beneficial do you think the scientific content of the application is in improving Viral Gastroenteritis?
The results showed that 75% of the responders preferred to refer to the application at the time of disease instead of reading physical texts (**Figure II**). They reported the effectiveness of the application content in improving disease as 86% (**Figure III**).

DISCUSSION

Viral Gastroenteritis mobile health application is designed to increase the awareness of different people in society, including ordinary people, medical school teachers, students, and health centre specialists in health departments with diseases directly caused by the aforementioned Viral Gastroenteritis.
Based on our awareness, it can be declared that an application for this disease has not been made in Iran, and this mobile-based application is the first software which deals with Viral Gastroenteritis.
Our study results showed that applying a mobile application to increase individuals' health awareness accompanied high user satisfaction. More than 80% of the study participants conceived mobile health applications as beneficial in improving Viral Gastroenteritis. The present study results were in line with Alizadeh I 2019[11], who reported user satisfaction higher than 80% and user conception of the app's scientific beneficence higher than 78%.
A study on an application developed for tuberculosis[12] reported high user satisfaction, consistent with our study results. In line with our results, another study by Ghazisaeedi M 2015[13] reported that 82% of the caregivers welcomed the application and conceived it as beneficial for providing their necessary information. A study in 2014 showed that users preferred to use mobile apps in learning English and integrate this method with other learning procedures. In line with theirs, our study results showed that the study participants preferred to use the application in learning over the classic methods.
Nasiri M 2014[14] showed that, like having lectures, mobile health applications improve medical students' learning and memorization processes. Our study results showed that students prefer studying on phones over the classic physical paper. In line with our study, it was established in several studies, including Kamal MN[15] and Papzan AAH 2010[16], that using mobile education applications further improves the students' performance in learning.
Generally, this mobile health application doesn't need an internet connection and the internet and allows its users to enable offline access. Using this mobile-based software, people gained full knowledge and consciousness to identify and control viral gastroenteritis, which can be helpful in emergencies such as natural disasters (floods).

CONCLUSION

According to the inquiry outcomes, using this didactic software can increase users' awareness when facing viral gastroenteritis. According to the lack of such application and the increase in the prevalence of viral gastroenteritis in many provinces in recent years, designing such software can help increase people's awareness and prevent the epidemic of viral disease. Hence, we suggested this software to the target community, including families, school teachers, health centre experts and students of medical universities.

Ethical Permission: Abadan School of Medical Sciences Iran Research Ethics Committee letter No. IR.ABADANUMS.REC.1399.084, Dated: 26-08- 2020.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: There was no funding agency used for this research.

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Zandi M:	Idea conceived and designed software
Alizadeh I:	Analysis
Soltani S:	Text writing
Vali M:	Data collection
Ebrahimi S:	Data collection
Abbasi S:	Supervision of research

REFERENCES

1. Teimoori A, Nejati M, Ebrahimi S, Makvandi M, Zandi M, Azaran A. Analysis of NSP4 Gene and Its Association with Genotyping of Rotavirus Group A in Stool Samples. Iran Biomed J. 2018; 22(1): 42-49. doi: 10.22034/ibj.22.1.42.
2. Shane AL, Mody RK, Crump JA, Tarr PI, Steiner TS, Kotloff K, et al. 2017 Infectious Diseases Society of America clinical practice guidelines for the diagnosis and management of infectious diarrhea. Clin Infect Dis. 2017; 65 (12): e45-e80. doi: 10.1093/cid/cix669.
3. Bresee JS, Duggan C, Glass RI, King CK. Managing acute gastroenteritis among children; oral rehydration, maintenance, and nutritional therapy. MMWR Recomm Rep. 2003; 52(RR-16): 1-16.
4. Blacklow NR, Greenberg HB. Viral gastroenteritis. New Engl J Med. 1991; 325(4): 252-264. doi: 10.1056/NEJM199107253250406.
5. Bányai K, Estes MK, Martella V, Parashar UD. Viral gastroenteritis. Lancet. 2018; 392(10142): 175-186. doi: 10.1016/S0140-6736(18)31128-0.
6. Cho SR, Chae SJ, Jung S, Choi W, Han MG, Yoo CK, Lee DY. Trends in acute viral

gastroenteritis among children aged≤ 5 years through the national surveillance system in South Korea, 2013–2019. J Med Virol. 2021; 93(8): 4875 -82. doi: 10.1002/jmv.26685.
7. Farthing M, Salam MA, Lindberg G, Dite P, Khalif I, Salazar-Lindo E, et al. Acute diarrhea in adults and children: a global perspective. J Clin Gastroenterol. 2013; 47(1): 12-20. doi: 10.1097/ MCG.0b013e31826df662.
8. Jalilian S, Teimoori A, Makvandi M, Zandi M. An in-vitro transcription assay for development of Rotavirus VP7. Iran J Microbiol. 2017; 9(3): 186-194.
9. Cukor G, Blacklow NR. Human viral gastroenteritis. Microbiol Rev. 1984; 48(2): 157-79. doi: 10.1128/mr.48.2.157-179.1984.
10. Sumi A, Rajendran K, Ramamurthy T, Krishnan T, Nair G, Harigane K, et al. Effect of temperature, relative humidity and rainfall on rotavirus infections in Kolkata, India. Epidemiol Infect. 2013; 141(8): 1652-1661. doi: 10.1017/S0950268 812002208.
11. Alizadeh I, Aghaei A, Hyati R, Mirr I. Satisfaction of Mobile Users with mobile Application "Identification, Prevention, and Control of Bed Bugs": Designing and Developing Mobile Health Application. J Health Biomed Inform. 2019; 6(1): 24-31.
12. Safdari R, Hasan Nejadasl H, Rostam Niakan-Kalhori S, Nikmanesh B. Design and evaluation of mobile-based self-management system for tuberculosis. J Payavard Salamat. 2018; 12(3): 230-238.
13. Ghazisaeedi M, Sheikhtaheri A, Safari A. Design and evaluation of an applied educational smartphone-based program for caregivers of children with cerebral palsy. J Clin Res Paramed Sci. 2015; 4(2): e81998.
14. Nasiri M, Nasiri M, Adarvishi S, Hadigol T. The effectiveness of teaching anatomy by mobile phone compared with its teaching by lecture. J Med Educ Delop. 2014; 7(14): 94-103 .
15. Kamal MN, Samouei R, Sarafzade S, Ghaebi N, Moradi F, Moradzadeh M. The Effect of Education via Mobile Phones on Procrastination of Iranian Users: Designing a Treatment Aid Application. J Health Biomed Inform. 2018; 5(2): 286-292.
16. Papzan AAH, Soleymani A. Comparing cell phone -based and traditional lecture-based teaching methods' effects on agricultural students' learning. Info Comm Technol Educ Sci. 2010; 1(1): 55-65.

AUTHOR AFFILIATION:

Milad Zandi
Department of Virology
School of Public Health
Tehran University of Medical Sciences
Tehran, Iran.

Ismaeil Alizadeh
Research Center of Tropical and Infectious Diseases,
Department of Vector Biology and Control
Faculty of Public Health
Kerman University of Medical Sciences
Kerman, Iran.

Saber Soltani
Department of Virology
School of Public Health\
Tehran University of Medical Sciences
Tehran, Iran.

Mohebat Vali
Student Research Committee
Shiraz University of Medical Sciences
Shiraz, Iran.

Saeedeh Ebrahimi
Department of Medical Microbiology
Faculty of Medicine Science
Kerman University of Medical Sciences
Kerman, Iran.

Samaneh Abbasi *(Corresponding Author)*
Department of Microbiology
School of Medicine
Abadan University of Medical Sciences
Abadan, Iran
Email: s_abbasi80@yahoo.com

Original Article

Young Adult's Health-Preventive Behaviors toward Coronavirus Disease 2019

Hayam Ibrahim Asfour, Nahla Hariri, Nahla Abdul-Gadir Tayyib, Fatmah Jabr Alsolami, Grace Lindsay

ABSTRACT

OBJECTIVE: To explore the young adult's coronavirus disease 2019 (COVID-19) health-preventive behaviors in Saudi Arabia.

METHODOLOGY: Semi-structured virtual interviews regarding health-preventive behaviors were conducted with 35 participants during the lockdown because of the pandemic. The Health Belief Model was used in the analysis and data presentation.

RESULTS: Young adults had feelings of fear, loneliness, anxiety, irritability, easy distraction, loss of concentration, and depression during the outbreak of the COVID-19 pandemic. Participants in this study were aware of the benefits of applying the health-preventive actions. The reported barriers hinder some of them from using some of the COVID-19 health-preventive steps are mainly related to social distancing and the curfew on some people. The participants reported their confidence in their COVID-19 health-preventive knowledge and stated that they could protect themselves and others from getting infected with COVID-19.

CONCLUSION: According to HBM, they strongly believe in health actions efficacy in their country and followed the COVID-19 health-preventive actions. Participants had a positive perception regarding the threat and severity of COVID-19 infection. Financial consequences of the curfew, noncompliance with the preventive actions' and lack of awareness of the importance of the health-preventive activities of some people are among the barriers to applying the COVID-19 health-preventive measures.

KEYWORDS: COVID-19, Young adult, Health promotion, Preventive Behaviors, Saudi Arabia

This article may be cited as: Asfour HI, Hariri N, Tayyib NAG, Alsolami FJ, Lindsay G. Young Adult's Health-Preventive Behaviors toward Coronavirus Disease 2019. J Liaquat Uni Med Health Sci. 2022;21(02):136-42. doi: 10.22442/jlumhs.2022.00934. Epub 2022 May 31.

INTRODUCTION

Since coronavirus disease 2019 (COVID-19) was announced as a pandemic, the deaths have exceeded millions worldwide[1]. As a result, some mandatory precautionary measures were taken by governments to control the pandemic of COVID-19; therefore, a curfew was implemented in many countries, and the Jeddah Governorate, including Makkah city in Saudi Arabia, implemented a curfew and closure of universities and schools. All these COVID-19 health preventive measures impacted the Youth's health and wellbeing[2].

Health preventive behaviors are the primary strategies used by individuals for reducing and controlling the transmission of any novel aggressive infection that lacks evidence-based vaccine and treatment. The Health Belief Model (HBM) is a model used to expect health-related behaviour in terms of particular belief patterns. In the early 1950s, a social scientist developed this model to predict adaptation in people's behavior[3]. This model has two health-related behaviour components; the belief in health actions efficacy and the decision to prevent disease or get better if already ill. Three categories motivate people to undertake a health-related behaviour: individual perceptions, modifying factors, and the likelihood of action. All these factors influence an individual's health-related behaviour to be healthier[3-4].

Youth in the 15-34 age group is considered among the majority Saudi population[5], they are the future, and their health is a priority. COVID-19 pandemic, increasing number of deaths and cases, curfew, and social distancing can create significant challenges to Youth's wellbeing. Studies revealed that many young adults might get sick from COVID-19 infection; their emotional, the pandemic may impact social and mental well-being[6-9]. In addition, it may affect their interaction with others and increase their anxiety and fear regarding the risk of infection[6]. Several studies in Saudi Arabia revealed that young people had a greater tendency for psychological distress than others.[9-11] A study by Elhessewi GMS 2021[9] reported a significant positive correlation between individuals' psychological distress and the perceived susceptibility and severity of COVID-19 infection. Another study reported the association of stress with that individuals' perception of fear of being in contact with COVID-19 positive cases or previously quarantined[12]. This study

Received: ***09-12-2021***
Revised: ***09-05-2022***
Accepted: ***11-05-2022***
Published Online: ***31-05-2022***

was carried out to examine young adults' COVID-19 health-preventive behaviors in Saudi Arabia using the HBM. Identifying factors affecting the implementation of health-preventive behaviors, especially among this age group, will help plan and implement effective programs to combat COVID-19 spread among Youth and the Community.

METHODOLOGY

Thirty-five participants over 18 years old were included in the study. Participant selection in the study was purposeful; we selected participants in the 15-34 age group[5] who can best inform and enhance understanding of the COVID-19 health-preventive behaviors among young adults. Participants were previously included in a research project which included 429 participants in the same age group. After completing the previous project, participants were asked if they could be contacted for other research opportunities.

We started recruiting participants once we had approval from the Faculty of Nursing, Umm Al-Qura University (March 2020), to carry out the study. At the beginning of each interview, consent was given written (by emails) and verbally to the participants. Most of the participants in the current study were female, of Saudi nationality, single, from 19 to 31 years of age, and educated. **Table I** shows the characteristics of the study participants.

TABLE I: CHARACTERISTICS OF THE STUDY PARTICIPANTS (n=35)

Socio-demographic characteristics		N (%)
Gender	Male	5 (14.28%)
	Female	30 (85.71%)
Nationality	Saudi	30 (85.71%)
	Non- Saudi	5 (14.28%)
Age in years	Less than 20	5 (14.28%)
	20- less than 30	29 (82.86%)
	30-less than 34	1 (2.86%)
Social status	Single	30 (85.71%)
	Married	5 (14.28%)
Education (degree)	Bachelor's degree	30 (85.71%)
	Diploma	2 (5.71%)
	Master	2 (5.71%)
	Doctor	1 (2.86%)

Data Collection

We used semi-structured virtual interviews, which the first author performed for data collection. After reviewing the relevant literature[8-11,13-15], we used a set of open-ended questions, which helped compare participants' responses. Virtual interviews are the most appropriate way to meet people during the lockdown because of the required health preventive precautions during the pandemic. The investigators constructed a set of wide-ranging open-ended questions, and an interview script was prepared to ensure consistency and standardization of the questions. We used the same manner in asking the questions in the interviews. The duration of each interview was 10–25 min.

All participants were asked about their COVID-19 health-preventive behaviors according to the HBM, which included (1) Modifying variables affecting COVID-19 health-preventive behaviors: demographic, psychosocial and structural variables. (2) Young adults' perceptions of COVID-19 threats according to the HBM. (3) The likelihood of COVID-19 preventive actions indicated the perceived benefits of applying COVID-19 health-preventive actions minus the perceived barriers to taking the recommended COVID -19 health-preventive actions. During all the interviews, notes were taken for asking the follow-up questions based on participants' responses. The participants were told they were on speakerphone, and all the participants consented to be audio-recorded. One investigator was only with them in the virtual room to keep their confidentiality and encourage the participants to talk freely. The participants' information was not used during the interview.

Data Analysis

Qualitative strategies and qualitative content analysis procedures were utilized in the data analysis. Three steps were used to make the study's content analysis: Transcription, Coding, and Content Analysis. ***Transcription:*** the investigators transcribed verbatim all audio-recorded interviews. Two research assistants typed all talks between the participants and the interviewer accurately. MAXQDA 2020 was used in the coding and processing of the qualitative data. Then, data were categorized and Arranged according to the applied codes for further data analysis.

Coding: We followed Fulcher-Rood K 2018[13] practices in coding in our study as the following: we completed the initial coding for all Interviews. Then, we continued to the Content Analysis of all coded interview excerpts were made in detail, and then a coding schema according to HBM was prepared by the investigators (the first, second, and third) to complete the initial coding.

After constructing the coding schema (**Table II**), one transcript was selected randomly and coded by the second and third investigators. The stability and reliability of the coding scheme were more than 90%. The following measures were implemented to perform the current study's content analysis. An analysis team was formulated (consisting of one primary investigator and two research assistants), discussing all transcript excerpts to determine the response theme according

to the HBM. Two reviews were performed on the final response themes through a peer-review strategy, and the analysis team ensured there was no bias in the analysis. To ensure the accuracy and completeness of the analysis, the fourth and the fifth investigators reviewed the corresponding transcript excerpts and the final response themes in the peer-review process.

In qualitative studies, participant accounts are validated through confirmability, Credibility, and peer review[14]. In our study, Credibility and confirmability were established through the size of the sample (large), and the analysis teams were structured logically and through data triangulation. Our study applied strategies of data source and investigator triangulation[15].

TABLE II: CODING DEFINITIONS

Coding according to the Health Belief Model (HBM)		Definition
Modifying variables affecting COVID-19 health-preventive behaviors	Psychosocial variables	Participants' words to express their opinion regarding the impact of COVID-19 life habits, relation with their peers and reference group, and the degree of their self-confidence in dealing with the threats of the COVID-19 pandemic indicate their personality.
	Structural variables	Specific participants' words give the meaning of the COVID-19 pandemic and ways of preventing COVID-19 infection.
Young adults' perceptions related to COVID-19 threats	The perceived susceptibility to getting infected with COVID-19	The participants used phrases & words to discuss the likelihood of having COVID-19 infection.
	The perceived severity of COVID-19 infection.	Examples were provided by the participants regarding the effect of COVID-19 infection and its severity.
Cues to implementing COVID -19 health-preventive actions.		Specific participants' words indicate their performance of COVID-19 health-preventive actions.
The likelihood of COVID-19 preventive actions	Perceived benefits of applying COVID -19 health-preventive actions	The participants provided reasons/rationales to explain why they implemented the recommended COVID-19 health-preventive actions.
	Perceived barriers to taking the recommended COVID-19 health-preventive actions.	The participants provided reasons/rationales to explain why they do not implement the recommended COVID-19 health-preventive actions.

RESULTS

The results are presented according to the HBM theoretical constructs. We used the participants' direct quotes and gave the participants unique ID codes represented in brackets after the quotes. The number of participants is shown to exhibit the strength or inadequacy of a response category.

Modifying variables affecting COVID-19 health-preventive behaviors according to the HBM:

The participants commonly discussed their feelings of fear, loneliness, anxiety, irritability, easy distraction, loss of concentration, and depression. (n = 30). For example, one participant in this study said, "since COVID-19, everything makes me anxious". Similarly, another participant said, "The issue that I have to stay at home alone for a long time and this is something that affects my psyche and my abilities in general, and that the holiday comes and we cannot celebrate it with the ones we love". Other responses included the following: (a) communicating with their friends most of the time through different social media, (n=25), (b) changes in their lifestyle such as disturbed the pattern of sleep and decrease physical activities, (n = 15), (c) the workload more than before because the way of education was changed describing that they had to make more efforts than before (i.e., assignments, research studies, presentations, and online exams; n = 10), (d) fear of being obese, for example, one participant in this study said: *"I am afraid of weight gain from eating, sleeping, and sitting at home"*. Participants (n=35) showed enough COVID-19 related Knowledge and its prevention.

Young adult perceptions related to COVID-19 threats according to the HBM:

Twenty participants reported that they could have COVID-19 infection easily. For example, one said, "I have low immunity because of pregnancy, and I fear getting infected with the virus". Fifteen participants stated that they have good immunity but are afraid of being in contact with COVID-19 positive. Regarding the perceived COVID-19 severity among young adults, seventeen participants reported that COVID-19 infection is not so severe, but its severity depends on the patients' condition. Nine participants revealed that the issue is that COVID-19 infection spreads quickly, which can increase cases number. Eleven participants said the COVID-19 infection is more severe in the elderly and individuals with chronic disease.

There are other frequent responses; (a) fear of losing loved relatives because of COVID-19 infection; (n=31). For example, one said, "My mother's immunity is weak due to her cancer, and I fear that she may get infected with the virus". (b) increasing positive case numbers will affect the hospital's capacity and increase the number of deaths; n=10). (c) Participants reported the effect of COVID-19 on their studies and academic achievements; n=25). (d) Other participants discussed the consequences of increasing the

duration of curfew, which will affect the economy and the requirements of daily life from their point of view; n=5). For example, one of the participants said, "the financial consequences on people, especially for families whose income is based on daily wages, if it continues for a longer period", and (e) the fear of the end of life; (n=1).

The likelihood of COVID-19 health-preventive actions according to the HBM:

Most participants (n=23) stated they implemented the recommended COVID-19 health-preventive actions. Most participants (n=25) reported that they had enough COVID-19-related knowledge and could protect themselves and others from getting infected with COVID-19 infection.

Cues to COVID-19 health-preventive actions and participant's self-efficacy:

Participants showed a high level of acceptance of the Saudi regulations related to the COVID-19 pandemic and reported that they followed the COVID-19 health-preventive actions. Many triggers affected the participants and motivated them to apply the COVID-19 health-preventive measures, which were; (a) protection of their loved relatives from having COVID-19 infection (n=15), (b) prevention of the occurrence of new cases with COVID-19 infection (n=30), especially some of their relatives who had COVID-19 infection, had complications from the illness (n=5). They also reported their need to leave their homes and have an everyday life when the pandemic ends (n=7).

Participants were aware of the benefits of implementing the health-preventive actions, and they stated that the pandemic could be controlled by following the health-preventive steps (n=33). Most participants (n=35) indicated that they followed the health-preventive actions to protect their loved relatives from contracting COVID-19. The participants reported some barriers to apply the COVID-19 health-preventive measures, which are the financial consequences of the curfew on some people (n=7); noncompliance of some people to the preventive actions (n=10); and lack of awareness of the importance the COVID-19 health-preventive measures (n=6). For example, one participant said, "Lack of awareness of the elderly who are not convinced at all and the urgency to change some social habits causes me anxiety and is difficult".

DISCUSSION

Modifying variables affecting COVID-19 health-preventive behaviors according to the HBM:

Young adults expressed many psychological symptoms indicating their personalities and the COVID-19 pandemic impacted them. These reported symptoms were anxiety, irritability, easy distraction, loss of concentration, disturbed sleep, and depression. In addition, they reported that their physical activities decreased, and their workload increased. These results are similar to the findings of other studies regarding the COVID-19 outbreak[16-18]. Similar to our results, Abbas AM 2020[19] and Alsalhe TA et al.[20] stated that stressors could reduce the practice of worsening sleep quality and physical activity, leading to increased food intake. The participants indicated that they had enough Knowledge about COVID-19 and its prevention, which is also reported in the studies of Almofada SK et al.[21] and Alahdal H 2020[22]; however, participants' COVID-19 knowledge was not enough in other studies[23,24].

Young adult perceptions related to COVID-19 threats according to the HBM:

Regarding the participants' perceptions of the COVID-19 threat, it was noted that all the participants perceived susceptibility to getting infected with COVID-19. However, participants reported that the severity of COVID-19 depends on the patients' condition and immunity status. In addition, they expressed their opinion regarding the consequences of the quick spread of COVID-19 infection, the duration of curfew on their family/relatives, academic achievement, and the requirements of daily life. The presence of family members suffering from COVID-19 infection is associated with increased participants' anxiety levels, as reported in Cao W et al.[12] and Albagmi FM 2021[10] studies. The significant number of cases and deaths in the early period of the COVID-19 pandemic may be a reason for the participants' perceptions of the COVID-19 threat. In this age group, young adults are increasingly aware of responsibilities to family and community, and therefore, they are concerned with the health of their loved family members and peers. They also have increased and evolving capacity for goal setting and decision-making; questioning faith, beliefs, and meaning of life may reflect their perception and response toward the COVID-19 pandemic.

Likelihood of COVID-19 health-preventive actions according to the HBM:

Participants in this study were aware of the benefits of applying the COVID-19 health-preventive actions. Chee JCC et al.[25] and Joseph R 2021[26] agree with our results. The participants reported their ability to protect themselves and others from the COVID-19 infection by following the recommended health-preventive measures. However, in our study, participants reported the presence of some barriers that hinder some of them from applying some of the COVID-19 health-preventive actions, which are mainly related to social distancing and the financial consequences of the curfew on some people. In this issue, participants reported the noncompliance of some members to the COVID-19 health-preventive actions. On the other hand, Al-Hanawi MK et al.[23] found that young adults have better COVID-19 practices than older adults. However, studies reported other barriers such as

anxiety and stress of disease, lack of availability of disinfectants and masks, imposing financial costs on participants, and exhaustion from the existing conditions[27-29].

The results of this study showed that the participants have great self-confidence. They reported their confidence in their COVID-19 health-preventive knowledge. They stated that they could protect themselves and others from getting infected with COVID-19 infection, indicating their perception of competency in performing the COVID-19 health-preventive actions. These results are also reported by Alrasheedy AA 2021[30] and others[23-26]. The participants' educational level may be essential in encouraging them to follow the COVID-19 health-preventive actions. The perception of self-confidence may be related to their developmental characteristics such as having a firmer sense of independent identity, including; increased emotional stability and self-reliance, and a deeper connection to peers, Community, and family relationships.

CONCLUSION

According to HBM, they strongly believe in health actions efficacy in their country, and they followed the COVID-19 health-preventive actions. Participants had a positive perception regarding the threat and severity of COVID-19 infection. Financial consequences of the curfew, noncompliance with the preventive actions' and lack of awareness of the importance of the health-preventive activities of some people are among the barriers to applying the COVID-19 health-preventive steps. Future studies are needed to assess the performance of health-preventive measures by observational methods. More studies are required to identify other factors affecting young adults' health-preventive behaviors. In addition, stakeholders should identify the needs and problems of young adults and consider them when planning preventive health programs.

ACKNOWLEDGEMENTS

The authors would like to thank all people and participants who supported us, willingly spent their valuable time, and provided thoughtful and attentive responses during the pandemic of COVID-19.

Ethical permission: Umm Al-Qura University, Kingdom of Saudi Arabia, ERC letter No. UQU/FON/ NP: 031, dated 03-05-2020.

Conflict of Interest: The authors have no conflicts of interest to declare.

Financial Disclosure / Grant Approval: No funding agency was used for this research.

Data Sharing Statement: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR CONTRIBUTIONS

Afsour HI: Conception or design of this article, involved in drafting, preparing the survey to collect, analyzing the data, and revising the major parts (Introduction, methodology, results and discussion) of the study.

Hariri N: Participated in drafting, revising this paper critically for important intellectual content, and final approval of the version to be submitted to a journal and to be published. Participating in drafting, revising this paper critically for important intellectual content, and final approval of the version to be submitted to a journal and to be published.

Abdul-Gadir Tayyib N: Involved in drafting, preparing the survey to collect and analyze the data, revising the results of this study, participating in drafting, revising this paper critically for important intellectual content, and final approval of the version to be submitted to a journal and to be published.

Alsolami FJ: Participated in drafting, revising this paper critically for important intellectual content, and final approval of the version to be submitted to a journal and to be published.

Lindsay G: Participated in drafting, revising this paper critically for important intellectual content, and final approval of the version to be submitted to a journal and to be published.

REFERENCES

1. WHO. Coronavirus (COVID-19) Dashboard. https://covid19.who.int/. Available from: https:// covid19.who.int/
2. Ismaeel Naar. "Coronavirus: Saudi Arabia imposes 24-hour curfew in several cities, including Riyadh". Al Arabiya News. 6 April 2020. Archived from the original on 7 April 2020. Retrieved 8 April 2020.). *Available from: https:// english.alarabiya.net/News/gulf/2020/04/06/ Coronavirus-Saudi-Arabia-imposes-24-hour-curfew-in-several-cities-including-Riyadh.*
3. Kim S, Kim S. Analysis of the Impact of Health Beliefs and Resource Factors on Preventive Behaviors against the COVID-19 Pandemic. Int J Environ Res Public Health. 2020; 17(22): 8666. doi: 10.3390/ijerph 17228666.
4. Costa MF. Health belief model for coronavirus infection risk determinants. Rev Saude Publica. 2020; 54: 47. https://doi.org/10.11606/S1518-8787.2020054 002494
5. General Authority for statistics. Saudi Youth in numbers, A report of International Youth Day 2020. Available from: https://www.stats.gov.sa/ sites/default/files/saudi_youth_in_numbers_ report_2020en.pdf (retrieved 8 April 2021).
6. Glanz K, Rimer BK, Viswanath K, eds. Health Behavior and Health Education: Theory, Research, and Practice. 4th ed. San Francisco, CA: Jossey-Bass; 2008: 97–121.

7. The Lancet Child Adolescent Health. Pandemic school closures: risks and opportunities. Lancet Child Adolesc Health. 2020; 4(5): 341. doi: 10.1016/S2352-4642(20)30105-X.
8. Alhazmi AM, Alshammari SA, Alenazi HA, Shaik SA, AlZaid HM, Almahmoud NS et al. Community's compliance with measures for the prevention of respiratory infections in Riyadh, Saudi Arabia. J Fam Community Med. 2019; 26 (3): 173–180. doi: 10.4103/jfcm.JFCM_4_19.
9. Elhessewi GMS, Almoayad F, Mahboub S, Alhashem AM, Fiala L. Psychological distress and its risk factors during COVID-19 pandemic in Saudi Arabia: a cross-sectional study. Middle East Curr Psychiatry. 2021; 28(1): 7. doi: 10.1186/ s43045-021-00089-6
10. Albagmi FM, AlNujaidi HY, Al Shawan DS. Anxiety Levels Amid the COVID-19 Lockdown in Saudi Arabia. Int J Gen Med. 2021; 14: 2161-70. doi: 10.2147/IJGM.S312465.
11. Alamri HS, Algarni A, Shehata SF, Al Bshabshe A, Alshehri NN, ALAsiri AM et al. Prevalence of Depression, Anxiety, and Stress among the General Population in Saudi Arabia during Covid-19 Pandemic. Int J Environ Res Public Health. 2020; 17(24): 9183. doi: 10.3390/ijerph17249183.
12. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J et al. The psychological impact of the COVID□19 epidemic on college students in China. Psychiatry Res. 2020; 287: 112934. doi: 10.1016/j.psychres. 2020.112934.
13. Fulcher-Rood K, Castilla-Earls AP, Higginbotham J. School-based speech-language pathologists' perspectives on diagnostic decision making. Am J Speech Lang Pathol. 2018; 27(2): 796–812. doi: 10.1044/2018_AJSLP-16-0121
14. Burns M, Baylor C, Dudgeon BJ, Starks H, Yorkston K. Asking the stakeholders: Perspectives of individuals with aphasia, their family members, and physicians regarding communication in medical interactions. Am J Speech Lang Pathol. 2015; 24(3): 341–357. doi: 10.1044/2015_AJSLP-14-0051.
15. Creswell JW, Poth CN. Qualitative inquiry and research design: Choosing among five approaches. Sage. 2012.
16. Liang L, Ren H, Cao R, Hu Y, Qin Z, Li C et al. The effect of COVID□19 on youth mental health. Psychiatr Q. 2020; 91: 841-852. doi: 10.1007/ s11126-020-09744-3.
17. Pereira M, Oliveira L, Costa C, Bezerra C, Pereira M, Santos C et al. The COVID-19 pandemic, social isolation, consequences on mental health and coping strategies: an integrative review. Res Soc Develop. 2020; 9(7): e652974548. doi: 10.33448/rsd-v9i7.4548.
18. Qiu J, Shen B, Zhao M, Wang Z, Xie B, Xu Y. A nationwide survey of psychological distress among Chinese people in the COVID-19 epidemic: Implications and policy recommendations. Gen Psychiatr. 2020; 33(2): e100213. doi: 10.1136/gpsych-2020-100213.
19. Abbas AM, Fathy SK, Fawzy AT, Salem AS, Shawky MS. The mutual effects of COVID-19 and obesity. Obes Med. 2020; 19: 100250. doi: 10.1016/j.obmed.2020.100250.
20. Alsalhe TA, Aljaloud SO, Chalghaf N, Guelmami N, Alhazza DW, Azaiez F et al. Moderation Effect of Physical Activity on the Relationship Between Fear of COVID-19 and General Distress: A Pilot Case Study in Arabic Countries. Front Psychol. 2020; 11: 570085. doi: 10.3389/fpsyg.2020.5700 85.
21. Almofada SK, Alherbisch RJ, Almuhraj NA, Almeshary BN, Alrabiah B, Al Saffan A et al. knowledge, attitudes, and practices toward COVID-19 in a Saudi Arabian population: a cross-sectional study. Cureus. 2020; 12(6): e8905. doi: 10.7759/cureus.8905.
22. Alahdal H, Basingab F, Alotaibi R. An analytical study on the awareness, attitude and practice during the COVID-19 pandemic in Riyadh, Saudi Arabia. J Infect Public Health. 2020; 13(10): 1446-1452. doi: 10.1016/j.jiph.2020.06.015.
23. Al-Hanawi MK, Angawi K, Alshareef N, Qattan AMN, Helmy HZ, Abudawood Y et al. Knowledge, attitude and practice toward COVID-19 among the public in the Kingdom of Saudi Arabia: a cross-sectional study. Front Public Health.2020; 8;217. doi: 10.3389/fpubh.2020.00217.
24. Zhong BL, Luo W, Li HM, Zhang QQ, Liu XG, Li WT et al. Knowledge, attitudes, and practices towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: a quick online cross-sectional survey. Int J Biol Sci. 2020; 16(10): 1745-1752. doi: 10.7150/ijbs.45221.
25. Chee JCC, Kong SWW, Tan ZJ, Lim YK, Pearce MS, Ong ELC. Perceptions, Attitude, Responses, Knowledge and Emotional Well-being (PARKE) of COVID-19 among students at Newcastle University Medicine Malaysia (NUMed). J Glob Health Rep.2021; 5: e2021002. doi: 10.29392/ 001c.18960.
26. Joseph R, Lucca JM, Alshayban D, Alshehry YA. The immediate psychological response of the general population in Saudi Arabia during COVID-19 pandemic: A cross-sectional study. J Infect Public Health. 2021; 14(2): 276-283. doi: 10.1016/ j.jiph.2020.11.017.
27. Ferdous MZ, Islam MS, Sikder MT, Mosaddek ASM, Zegarra-Valdivia JA, Gozal D. Knowledge, attitude, and practice regarding COVID-19 outbreak in Bangladesh: An online-based cross-sectional study. PLoS One. 2020; 15(10): e0239254. doi: 10.1371/journal.pone.0239254.

28. Pascawati NA, Satoto TBT. Public knowledge, attitudes and practices towards COVID-19. Int J Publ Health Sci. 2020; 9(4): 292-302. doi: 10.11591/ijphs.v9i4.20539.
29. Paul E, Alzaydani Asiri IA, Al-Hakami A, Chandramoorthy HC, Alshehri S, Beynon CM et al. Healthcare workers' perspectives on healthcare-associated infections and infection control practices: a video-reflexive ethnography study in the Asir region of Saudi Arabia. Antimicrob Resist Infect Control. 2020; 9(1): 110. doi: 10.1186/s13756-020-00756-z.
30. Alrasheedy AA, Abdulsalim S, Farooqui M, Alsahali S, Godman B. Knowledge, Attitude and Practice About Coronavirus Disease (COVID-19) Pandemic and Its Psychological Impact on Students and Their Studies: A Cross-Sectional Study Among Pharmacy Students in Saudi Arabia. Risk Manag Healthc Policy. 2021; 14: 729 -741. doi: 10.2147/RMHP.S292354.

AUTHOR AFFILIATION:

Prof. Hayam Ibrahim Asfour
(Corresponding Author)
Nursing Practices Department, Faculty of Nursing
Umm Al-Qura University
Makkah, Kingdom of Saudi Arabia.
Email: hayamasfour2002@gmail.com

Dr. Nahla Hariri
Assistant Professor
Community Medicine & Primary Health Care
for Pilgrims Department
Faculty of Medicine
Umm Al-Qura University, Makkah, Saudi Arabia.

Dr. Nahla Abdul-Gadir Tayyib
Associate Professor
Nursing Practices Department, Faculty of Nursing
Umm Al-Qura University
Makkah, Kingdom of Saudi Arabia.

Dr. Fatmah Jabr Alsolami
Associate Professor
Nursing Practices Department, Faculty of Nursing
Umm Al-Qura University
Makkah, Kingdom of Saudi Arabia.

Prof. Grace Lindsay
Nursing Practices Department, Faculty of Nursing
Umm Al-Qura University
Makkah, Kingdom of Saudi Arabia.

Original Article

Willingness to Pay for Covid-19 Vaccine by Frontline Health Workers in Tertiary Institutions in Nigeria

Saka Mohammed Jimoh, Abdullahi Ahmed, Oloyede Hassan Kehinde, Opowoye Segun Emmanuel

ABSTRACT

OBJECTIVE: To explore the willingness to pay (WTP) for COVID-19 vaccines among the frontline Health workers in Nigeria and the determinants of payment for COVID-19 Vaccines.

METHODOLOGY: A descriptive cross-section survey was carried out among 115 randomly nominated frontline healthcare workers using a multistage sampling technique in Kwara and Ogun States of Nigeria. The workers aged 18 years and above who consented to participate in the survey were eligible for the study. Data analysis was done using SPSS version 23, and ethical approval was obtained from the institution.

RESULTS: The results showed a 35.7% level of WTP, of which 78.6% of WTP respondents were ready to pay USD$10 for the Vaccine. More respondents with chronic diseases were eager to pay for the Vaccine at 77.8%, which was statistically significant.

CONCLUSION: The predisposition of frontline healthcare workers to pay for the COVID-19 Vaccine increased with vaccine efficacy and less vaccine cost. The study revealed that most respondents were WTP USD$10 for COVID-19 vaccines. Trusted policy makers should be used for advocacy in combating the misinformation on COVID-19 vaccines.

KEYWORDS: COVID-19 Vaccine, Willingness to pay, Frontline healthcare workers, Efficacy, Safety, Pandemic

This article may be cited as: Jimoh SM, Ahmed A, Kehinde OH, Emmanuel OS. Willingness to Pay for Covid-19 Vaccine by Frontline Health Workers in Tertiary Institutions in Nigeria. J Liaquat Uni Med Health Sci. 2022;21(02):143-8.
doi: 10.22442/jlumhs.2022.00899

INTRODUCTION

The covid-19 pandemic has affected countries' economies globally, especially developing countries, including Nigeria, with minimum wages of USD 64 for their workers.[1] Nigeria has about 167,155 confirmed COVID-19 cases with more than 2,117 deaths, and healthcare workers make up 10% of this mortality.[2,3] Globally, we have 178 million documented cases, while over 3.8 million deaths have occurred.[4]

The pandemic has negatively affected the day-to-day lives of individuals and families all over the globe, with healthcare workers (HCWs) among the highest risk groups for COVID-19 infection. This has negatively affected their wellbeing, finances and mental capabilities through the alteration of their daily patterns of existence.[5] To curb this pandemic, apart from non-pharmaceutical methods, administering a potent vaccine is essential for controlling this infection, death and even the gradual economic impact.[6] The research and development of the COVID-19 Vaccine by pharmaceutical companies through subsidized by some governments have been at a high cost.[6] The need to transfer this cost to the individual is becoming inevitable and essential to the willingness to pay. Being a healthcare worker and having a high income were factors related to a greater readiness to pay for the Vaccine.[7] Are health workers willing to pay for this preventive Vaccine if the need arises?

Healthcare workers are an essential source of evidence for the efficacy of vaccines. Their readiness to part with a fee for the Vaccine will promote and validate the immunization against this life-threatening disease among the general population.[7,8] These workers are ranked among the high-risk groups measured as contenders for early vaccination. It is therefore imperative to consider the readiness of these frontline workers to pay for immunization against this disease to tackle and debunk the identified rejection driven by myths and conspiracy theories.[7]

The information obtained from the willingness of healthcare workers to pay would provide the basis for a payment plan for the vaccination of individuals against the illness.[9] However, to achieve increased acceptance of the Vaccine, there may be a need to partly provide financial subsidies to selected categories of people affected by health inequities and develop risk communication materials to provide adequate information to members of the public within the country.[7,9]

The objectives of this study hinge on the level of

Received: ***24-06-2021***
Revised: ***06-06-2022***
Accepted: ***15-06-2022***

willingness to pay (WTP) and factors of readiness to pay for the COVID-19 Vaccine amongst frontline healthcare workers.

METHODOLOGY

An analytical cross-sectional study was conducted among 115 respondents in 2 Federal Tertiary hospitals. FMC Abeokuta 45 respondents and 70 respondents at UITH Ilorin. The study period was from January to April 2020. HCWs (doctors, nurses, pharmacists and administrators) aged 18 years or older currently employed in the two hospitals were accepted as respondents for the study. Younger (aged less than 18 years) HCWs and those absent during the survey were excluded. After providing adequate information about the study, all participants agreed to and signed a consent form. The ethics committee approved the study of UITH. The multistage sampling method of which frontline HCWs were stratified into doctors, nurses, pharmacists and administrators, and the systemic sampling technique was later used to select respondents from the sample frame for the study sample size. Data were analyzed using SPSS 23.0 software. Categorical data related to demographic variables are presented as frequencies and proportions. The associations between independent variables and the primary outcomes were tested using the Chi-square test as appropriate and multiple logistic regressions. The level of significance was set to 0.05 (two-tailed).

RESULTS

Table I WTP for COVID-19 Vaccine with Social Demographic variables. The modal age range of respondents (46.2%) who were WTP (31-40 years). This was not statically significant. Male respondents (43.6%) were more WTP for the Vaccine when compared with their female counterparts. A higher proportion of married staff had a greater WTP at 37.4%. Laboratory scientists were WTP (62.5%) among HCW though not statically significant; a statistical significantly WTP was seen with a higher proportion of respondents with Chronic Diseases were (77.8%).

TABLE I: WTP FOR COVID-19 VACCINE WITH SOCIAL DEMOGRAPHIC VARIABLES

	WTP				
	Yes	**No**	**Total**	**χ^2**	***p*-value**
Variable	**n(%)**	**n(%)**	**N**		
Age (years)					
≤ 30	6 (42.9)	8 (57.1)	14	6.953	0.073
31 – 40	18 (46.2)	21 (53.8)	39		
41 – 50	12 (37.5)	20 (62.5)	32		
51 – 60	5 (16.7)	25 (83.3)	30		
Gender					
Male	17 (43.6)	22 (56.4)	39	1.621	0.203
Female	24 (31.6)	52 (68.4)	76		
Marital status					
Single	4 (33.3)	8 (66.7)	12	1.968^F	0.441
Married	37 (37.4)	62 (62.6)	99		
Widowed	0 (0.0)	4 (100.0)	4		
Number of children					
None	7 (70.0)	3 (30.0)	10	5.712	0.057
1 – 3	23 (31.5)	50 (68.5)	73		
> 3	11 (34.4)	21 (65.6)	32		
Cadre					
Doctor	12 (37.5)	20 (62.5)	32	8.423	0.077
Nurse	6 (20.0)	24 (80.0)	30		
Pharmacist	10 (52.6)	9 (47.4)	19		
Lab scientist	5 (62.5)	3 (37.5)	8		
Admin	8 (30.8)	18 (69.2)	26		
History of chronic Disease					
Yes	7 (77.8)	2 (22.2)	9	7.553^F	**0.010***
No	34 (32.1)	72 (67.9)	106		
Ever been tested for COVID-19					
Yes positive	1 (25.0)	3 (75.0)	4	0.230^F	1.000
Yes negative	7 (35.0)	13 (65.0)	20		
No	33 (36.3)	58 (63.7)	91		
Intervention for a positive result					
Self-isolation	1 (33.3)	2 (66.7)	3	0.444^F	1.000
Isolation with treatment	0 (0.0)	1 (100.0)	1		
Knows someone tested for COVID-19 in immediate social network					
Yes	27 (44.3)	34 (55.7)	61	4.198	**0.040***
No	14 (25.9)	40 (74.1)	54		
Result of test (n = 61)					
Positive	19 (46.3)	22 (53.7)	41	0.570^F	0.888
Negative	7 (38.9)	11 (61.1)	18		
I don't know	1 (50.0)	1 (50.0)	2		
Treatment offered to positive cases					
Self-isolation	6 (46.2)	7 (53.8)	13	1.169^F	0.859
Isolation without treatment	1 (100.0)	0 (0.0)	1		
Isolation with treatment	12 (44.4)	15 (55.6)	27		

χ^2: Chi square test; F: Fisher's exact test; *: p value <0.05

Table II: WTP for COVID-19 vaccine

Amongst the respondents, 35.7% are willing to pay for the COVID-19 Vaccine. However, those willing to pay $67.00 for the Vaccine were about 34.1%, at $37.00, they were 65.3% of respondents, but at a lower cost of $10.00, those willing to pay (WTP) jumped to 78.6%. The table also shows that when Vaccine had a 50% chance of prevention, WTP among respondents were (65.9%) but rose significantly to (78.00%) when the

chance of prevention stood at 90%.

TABLE II: WTP FOR COVID-19 VACCINE

Variable	Frequency	Percent
Would you pay for the COVID-19 Vaccine if it is available		
Yes	41	35.7
No	62	53.9
I don't know	12	10.4
Would you pay the US $67 (Minimum wage) for the COVID-19 Vaccine (n = 41)		
Yes	14	34.1
No	27	65.9
Would you pay the US $38 for the COVID-19 Vaccine (n = 41)		
Yes	20	48.3
No	21	51.7
Would you pay US$10 for the COVID-19 Vaccine (n = 41)		
Yes	32	78.6
No	9	21.4
If the Vaccine has a 50% chance of prevention from COVID-19 (n = 41) Would pay for this		
Yes	27	65.9
No	13	31.7
I don't know	1	2.4
If the Vaccine has a 90% chance of prevention from COVID-19 (n = 41)		
Would pay for it even with a 90% chance of preventing COVID-19		
Yes	32	78.0
No	8	19.5
I don't know	1	2.4

**US$67.00 Current Country Minimal wage US$10 Previous minimal wage*

Table III: Level of trust and confidence of persons/ influencers involved in management and WTP for COVID-19 in Nigeria.

This table depicts the level of confidence among respondents in sources of information and influencers about vaccines on COVID-19 and willingness to pay WTP were found to be highest in their doctors (mean rank =2.00) with varying degrees of confidence and trust in other organizations/influencers such as the Nigerian Centre for Disease Control (NCDC) with a mean rank of 4.16 and religious leaders (4.77). However, the level of trust was lowest in patent drug store owners (mean=7.21).

DISCUSSION

The level of willingness to pay and the cost of the COVID-19 Vaccine will be based on many factors when the inevitable era of payment for the vaccine surface. Developing Countries such as Nigeria, with meager incomes, will have to design a cost-efficient model to ensure individuals get vaccinated without unduly getting financially over-burdened or weakening the health system's finances. The ideal cost people are willing to incur to be vaccinated would be based on market forces such as demand and supply while taking into consideration the peculiarities of the health care market.

The study respondents were predominantly female, 76 (66.1%). The mean age of respondents was 42.95 ± 10.71. This finding was in agreement with the mean age of Nigeria's Federal workers.[8] More than three-quarters of respondents are married with a mean family size of four, which aligns with the national average of 4.14± 2.67.[8.] The rate of conducting COVID 19 tests among the respondents was found to be poor, with less than one-fifth of HCW having been tested for the disease and less than a tenth being positive. The predominant course of action among those who tested positive was that they proceeded

TABLE III: LEVEL OF TRUST AND CONFIDENCE OF PERSONS/INFLUENCERS INVOLVED IN MANAGEMENT AND WTP FOR COVID-19 IN NIGERIA

	Very Little	Little	Some	Much	Very Much	Don't know	Level of confidence
Variable	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**n(%)**	**Mean rank**
Your own doctor	2(1.7)	2(1.7)	15(13.0)	47(40.9)	47(40.9)	2(1.7)	2.00
Patent Drug Seller	57(49.6)	33(28.7)	8(7.0)	9(7.8)	6(5.2)	2(1.7)	7.21
Primary Health Centre	7(6.1)	25(21.7)	33(28.7)	26(22.6)	22(19.1)	2(1.7)	4.90
State Health Department	6(5.2)	14(12.2)	38(33.0)	40(34.8)	15(13.0)	2(1.7)	4.72
Nigerian Centre for Disease Control (NCDC)	3(2.6)	14(12.2)	30(26.1)	40(34.8)	26(22.6)	2(1.7)	4.16
Presidential Taskforce on COVID-19 (PTF)	5(4.3)	32(27.8)	34(29.6)	28(24.3)	14(12.2)	2(1.7)	4.66
Professional Organizations (e.g: NMA)	5(4.3)	7(6.1)	32(27.8)	39(33.9)	31(27.0)	1(0.9)	4.00
Religious Leaders	3(2.6)	24(20.9)	27(23.5)	35(30.4)	25(217)	1(0.9)	4.77
Traditional Leaders	34(29.6)	28(24.3)	34(29.6)	11(9.6)	4(3.5)	4(3.5)	6.80

NB: Ranking of persons/organization ranges between 1 - 9, with 1 being the highest level of confidence and 9 being the lowest

with self-isolation. The self-isolation of the positive respondents reflects the relative mildness of the symptoms experienced as they do not require hospitalization, which would have occurred in more severe manifestations of the disease. The respondents reported a higher positivity rate among their acquaintances, with about two-thirds (67.2%) reporting knowledge of individuals who had tested positive. Among those with positive results, 65.7% were treated in the isolation centres, which may also reflect the severity of the symptoms and signs of the disease.

The willingness to pay for COVID -19 vaccine was found to be below average in our Nigeria study, with only 41(35.7%) of the respondents willing to pay for a Vaccine against COVID-19 when it becomes available. This study further shows lower respondents among those WTP at a mean of US$67.00 to be 14 (37,7%), which later appreciated significantly when the cost was reduced to US$10 to 32(78,65% among those WTP). Prevention chance of the Vaccine to 90% also increased the WTP among respondents to 32 (78%). A related study in Ethiopia shows the magnitude of willingness to pay for a COVID-19 vaccine was 42.8%. Respondents were willing to pay the mean amount of money (US$ 10.04).[9] A study from Kenya also showed higher values of willingness to pay, with estimates of individuals' mean WTP for the Vaccine ranging from US$ 49.81.[10] Sex, income, affordability of the Vaccine, fear of side effects, support for the Vaccine, and perceived probability of acquiring COVID-19 infection were factors significantly associated with WTP for a COVID-19 vaccine similar to our study.

In a similar study in Jakarta, Indonesia, among those willing to pay, results showed more significant respondents that 78.3% (1,065) were WTP for the COVID-19 Vaccine with a median WTP of US$ 57.20 [11]. In the same Indonesian study, 16.1% (203) expressed that they were not willing to pay US$ 15.47. This advocates that if the vaccine price is higher than US$ 15.47, one-fifth of the population, at least in studied populations, may not become immunized.[11] This is similar to our study where respondents can only pay US$10, and 22% are unwilling to pay despite the limited cost.

This study shows WTP is about three times lower than that originated in the study in Malaysia (US$30.70) but within the variety of the WTP found in the study in Romania, which was US$59.26–US$474.08 for the high-income people, and US$23.70–US$237.04 for the whole population [12,13]. This will postulate a cross-subsidy model for the rich to subsidize the poor as a funding gap mechanism. Any country that cannot fully procure the vaccines for its citizens due to financial constraints could explore the route of providing the Vaccine at no cost to those at most significant risk and those within the identified vulnerable groups while levying a fee to individuals within the high-income bracket. The WTP among those in the high-income group would be predicated on their insight into the efficiency and safety of the vaccination process. Moreover, the results show that Front line Health workers are becoming scared of being infected with Virus as the pandemic progresses.[7] Also, government and public adherence to the non-pharmaceutical preventive protocol are becoming weak, and frontline health workers are more susceptible and at higher risk of becoming infected; perception is evident that the administration's performance in speaking to the pandemic is gradually becoming deteriorating, and fatigue has set in.

Our research also discovered the determinant link between those with chronic diseases and their willingness to pay for the Vaccine 77,8 %. The association has been expressed to indicate a positive association between willingness and capability to pay or the negative correlation where those having existing chronic diseases would have greater consideration of the significant value of being immunized. Also, having close acquittance tested positive for COVID-19 influenced people's WTP by 46.3%, which was statistically significant at P<0.004.

Likewise, to combat the disinformation regarding vaccination and vaccine hesitancy, as a result of this affecting willingness to pay for the Vaccine, attitudinal change must be preceded by vital information and health education on the importance of vaccination and the high benefit-risk ratio associated with vaccines, and the COVID-19 vaccines in this instance. Therefore, the confidence and trust in vaccines must be advocated for by trusted individuals and influencers to provide adequate and correct information to the people to influence their knowledge and WTP for the Vaccine when it arises. Providers, such as healthcare workers, health authorities, and policymakers, could provide the vaccine information, benefits, and safety.[14] Level of trust and confidence of persons/influencers involved in the management of Covid19 in Nigeria's study indicated that medical doctors (mean rank=2.00), professional bodies NMA (mean rank =4.00) and the Nigerian Centre for Disease Control (NCDC) with a mean level of 4.16 were trusted to provide truthful information on vaccination. This finding may be an invaluable tool for advocacy to discourage vaccine hesitancy. The misinformation on poor vaccine quality being conveyed by mass and social media, which includes rumours as offensive as the reduction in the population of Africans through vaccination, could influence healthcare workers on vaccine hesitancy, which could have a snowball effect on the decisions of their patients affecting WTP [15-17]. The need for advocacy campaigns by these trusted individuals and groups to combat this rising "infodermic" cannot be overstressed to ensure herd immunity against the

pandemics.

Another significant aspect is to consider the explanations for declining to pay for the Vaccine since results showed that about half of the frontline Health Workers (53.9%) are a risk to public health. Therefore, any campaign that is developed should consider subsidizing this group as well.[7]

The course of the change in the WTP in the imminent future will vary liable on how individuals consider the different factors of the socioeconomic and health atmosphere, including the vaccine efficacy and safety. From our research, those with a regular income provided the highest determinant for WTP for the Vaccine. The finding confirms results from a previous study.[10] From the preceding, it could be inferred that there is a direct correlation between the WTP and the ability to pay. However, there may be an indirect correlation in that those with a greater WTP could be due to greater appreciation for the benefit of being immunized against the disease.[13,14] In addition, individuals who perceive a higher vulnerability to disease are more willing to support and utilize vaccination support.[13] It is not surprising that those with a higher perceived risk of contracting COVID-19 were more willing to pay for vaccination against the disease.[14] It is also imperative to consider other predictors of vaccine uptake, such as the ease of access and recognition of the Vaccine.[7,11] The vaccination plans should incorporate these factors and those with perceived higher risk for contracting COVID-19 which are strong indicators for WTP for a new vaccine.[9,10,15]

CONCLUSION

The availability of a potent and safe COVID-19 Vaccine could lead to greater acceptance and WTP for the Vaccine. More than two-thirds of frontline healthcare workers in this study would be ready to pay for the Vaccine, with the mean amount at US$10. This could imply that frontline health workers who have a good source of income would have a greater WTP for immunity against the Virus. To this end, the Vaccine may be subsidized or provided free to lower-income people while higher-income groups could pay for it. One significant modifiable predictor of WTP is the apparent risk of contracting COVID-19, which should be considered for future health promotion drives.

RECOMMENDATIONS

We recommend that the Vaccine be subsidized or made free to low-income groups while levying a fee on those in high-income groups. This would be valuable, particularly for nations with economic problems. Thus, the part of healthcare workers (HCWs) becomes typically important in assuring clients and societies through role-exhibiting behaviors.

Ethical permission: Ministry of Health KWARA State Government Nigeria Ethical permission letter No. MOH/KS/EU/777/495, Dated; 18-01-2021.

Conflict of Interest: There is no conflict of interest among the authors

Financial Disclosure / Grant Approval: Funding remained strictly done by the authors.

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Jimoh SM: Conceptualization of the study
Ahmed A: Collection of data
Kehinde OH: Data analysis, write-up
Emmanuel OS: Collection of data, write-up

REFERENCES

1. Abada IM, Okafor NI, Omeh PH. New National Minimum Wage and States' Viability in Nigeria's Fragile Economy. Int J Adv Res Soc Sci Environ Stud Technol. 2019; 4(2): 20-36.
2. Nigeria Centre for Disease Control. Covid - 19 Nigeria. National centre for disease and control. Available from: https://covid19.ncdc.gov.ng/ (accessed on 31st March 2021).
3. Worldometer. Covid-19 pandemic. Available from: https://www.worldometers.info/ coronavirus/?utm_campaign=homeAdUOASi.
4. National Population Commission (NPC) [Nigeria] and ICF. 2019. Nigeria Demographic and Health Survey 2018. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF.
5. Torales J, O'Higgins M, Castaldelli-Maia JM, Ventriglio A. The outbreak of COVID-19: coronavirus and its impact on global mental health. Int J Soc Psychiatry. 2020; 66(4): 317-320. doi: 10.1177/0020764020915212.
6. Ahmad T, Haroon H, Baig M, Hui J. Coronavirus disease 2019 (COVID-19) pandemic and economic impact. Pak J Med Sci. 2020; 36 (COVID19-S4): 73-8. doi: 10.12669/pjms.36. COVID19-S4.2638.
7. World Health Organization. Infodemic [Internet]. 2021 [cited 2021 Feb 10]. Available from: https:// www.who.int/teams/risk-communication/infodemic - management.
8. World Health Organization. Coronavirus disease (COVID-19) advice for the public. Coronavirus Dis 2019. 2020.
9. Alley SJ, Stanton R, Browne M, To QG, Khalesi S, Willaims SL et al. As the pandemic progresses, how does willingness to vaccinate against COVID-19 evolve? *Int J Environ Res Public Health.* 2021; 18(2): 797. doi: 10.3390/ijerph18020797.
10. Carpio CE, Sarasty O, Hudson D, Macharia A, Shibia M. The demand for a COVID-19 vaccine in Africa: evidence from Kenya. Hum Vaccin Immunother. 2020; 17(10): 3463-71. doi: 10.1080/ 21645515.2021.1938494.

11. Harapan H, Wagner AL, Yufika A, Winardi W, Anwar S, Gan AK et al. Willingness-to-pay for a COVID-19 vaccine and its associated determinants in Indonesia. Hum Vaccin Immun other. 2020; 16(12): 3074-3080. doi: 10.1080/21645515.2020.1819741.
12. Baker R, Donaldson C, Mason H, Jones-Lee M (2014). Willingness to Pay for Health. In: Culyer AJ, (ed), Encyclopedia of Health Economics (pp. 495-501). (Encyclopedia of Health Economics). Elsevier. https://doi.org/10.1016/B978-0-12-375678-7.00503-4.
13. Mudatsir M, Anwar S, Fajar JK, Yufika A, Ferdian MN, Salwiyadi S et al. Willingness-to-pay for a hypothetical Ebola vaccine in Indonesia: a cross-sectional study in Aceh. F1000Res. 2019; 8:1441. doi: 10.12688/f1000research.20144.1.
14. Lang HC. Willingness to Pay for Lung Cancer Treatment. Value Health. 2010; 13(6): 743-9. doi: 10.1111/j.1524-4733.2010.00743.x.
15. Lipovetsky S, Magnan S, Zanetti-Polzi A. Pricing Models in Marketing Research. Intelligent Information Management. 2011; 3(5): 167-74.
16. Research World. A New Approach to Study Consumer Perception of Price. Research World [Internet]. 2015, June 09. [cited 2020 Apr 10]. Available from: https://www.researchworld.com/a-new-approach-to-study-consumer-perception-of-price/
17. Tobin EA, Okonofua M, Azuka A, Obi A. Willingness to acceptance a covid-19vaccine in Nigeria: a population-based cross-sectional study. Central Afr J Public Health. 2021; 7(2): 53-60. doi: 10.11648/j.cajph.20210702.12.

AUTHOR AFFILIATION:

Saka Mohammed Jimoh
Department of Epidemiology and Community Health
University of Ilorin, Nigeria.

Abdullahi Ahmed
Department of Community Medicine
Federal Medical Centre, Abeokuta, Nigeria.

Oloyede Hassan Kehinde
Department of Epidemiology and Community Health
University of Ilorin, Nigeria.

Opowoye Segun Emmanuel
(Corresponding Author)
Department of Epidemiology and Community Health
University of Ilorin, Nigeria
Email: segun2014dr@gmail.com

Short Survey

Impact of COVID-19 Vaccination on the Attitude of Health Care Workers toward Preventive Measures

Muhammad Raheel Raza, Furqan Ali Taj, Hassan Mumtaz, Syed Muhammad Ismail, Ramsha Amjad, Hamza Ehsan

ABSTRACT

OBJECTIVE: To compare the pre and post-vaccination effects of vaccination on various COVID SOPs and to determine whether or not HCWs take adequate precautions.

METHODOLOGY: This cross-sectional study was conducted between May and July 2021. Online survey forms were distributed via social media platforms, completed by male and female house officers, medical officers, postgraduate trainees, residents, and specialists/consultants at Holy Family Hospital in Rawalpindi.

RESULTS: Our study enrolled 104 volunteers. The participants ranged in age from 18 to 30 years, and males constituted more than half of the study population. The most frequently used designation was postgraduate trainees/residents, which accounted for 34% of all participants. 100% of medical professionals used masks before vaccination, and 45% of medical professionals practiced social distancing. Fourteen of the participants discontinued the use of masks following vaccination. Hand washing and sanitizing habits decreased by 14.

CONCLUSION: Vaccination has made life easy for HCWs, as negative trends are observed towards preventive measures. The pandemic timeline and physical and mental well-being depreciation also played a crucial role in the COVID-19 SOPs. So let us all hope that the whole population gets vaccinated and the virus gets eradicated.

KEYWORDS: Attitude, SARS-COV-2, Vaccination, Healthcare workers, COVID-19, Practices, Knowledge

This article may be cited as: Raza MR, Taj FA, Mumtaz H, Ismail SM, Amjad R, Ehsan H. Impact of COVID-19 Vaccination on the Attitude of Health Care Workers toward Preventive Measures. J Liaquat Uni Med Health Sci. 2022;21(02):149-52. doi: 10.22442/jlumhs.2022.00926

INTRODUCTION

Health care workers (HCWs) include doctors, nurses, and laboratory technicians ETC, who provide aid and help to the sick[1]. Whenever an emergency like a natural disaster or disease outbreak, they stood as a concrete wall, supported their nations, and got them through the most challenging times. They have always been the first line of defense[2].

COVID 19 burst out in Wuhan in China in December 2019 and was soon declared a pandemic in March 2020[3]. Severe lockdowns were imposed worldwide as it was a make-or-break situation, and hundreds of thousands of lives were at stake. But even in these challenging times, health care workers acted efficiently and effectively and stood firm. Because of them, we are on the verge of easing the COVID-19 restrictions[4].

Besides HCWs, vaccination has played a considerable role in saving lives and reducing the load on health care facilities[5]. In the past, vaccines have been proven to be an essential weapon to fight against different pathogens; it's because of vaccination we could eradicate measles, smallpox and almost polio[6-8]. It proved to be a breakthrough during the coronavirus pandemic.

This study will highlight the impact of vaccination on the attitude of HCWs towards preventive measures. This study will compare the effects of vaccination on various COVID SOPs before and after vaccination. Will showcase whether the HCWs are taking adequate preventive measures or not. It will also enlighten us about the variance in attitudes towards preventive measures with the difference in designation and age group.

Received: *15-11-2021*
Revised: *18-04-2022*
Accepted: *25-04-2022*

METHODOLOGY

We conducted this cross-sectional study in May-July 2021 at Holy Family Hospital, affiliated with Rawalpindi Medical University. Our sample comprised 104 patients who were enrolled through a stratified random sampling technique. Both males and females house officers, medical officers, postgraduate trainees or residents and specialists/consultants working at Holy Family Hospital were included in our study. Nursing staff members, undergraduate medical students, physiotherapists & those who were not vaccinated for COVID 19 were excluded from our study. Ethical approval for this research was granted by the Department of Medicine, Holy Family Hospital Rawalpindi wide letter ref MU1-071-15Mar21.

For this study, we disseminated an online survey form

via social media platforms questionnaire comprised of 2 sections. Section1 of the survey concerned basic demographics like age and gender designation, and Section 2 consisted of questions regarding the preventive measures and protocols to be followed to restrict the spread of COVID-19.

To determine the significance and correlation of the impact of vaccination on the attitude of medical professionals and gender-based differences, we used the t-test and Pearson's Chi-square test. The significance level was set at $p<0.05$. A detailed review and analysis were done, and results were presented using percentages and frequencies displayed using tables. For quantitative variables mean standard deviation was calculated by SPSS version 21.

RESULTS

All the health care workers vaccinated for COVID 19 took part in the study; 104 volunteers complied with the inclusion criteria and filled the online Performa. The age group ranged from 18-60 years, but most participants were 18-30, and the second common group was 30-40 years. A male population made up more than half of the study population. Additionally, the most repetitive designation was the postgraduate trainees/residents, comprising ¾ of the total participants. Consultants and specialists were the next large group of participants.

TABLE I: AGE, GENDER CHARACTERISTICS ALONG WITH DESIGNATION OF HEALTH CARE WORKERS

Gender	**Male n(%)**	**Female n(%)**	
	59(56.7)	45(43.3)	
Age	18-30 n(%)	30-40 n(%)	40-50 n(%)
	67(64.4)	20(19.2)	12(11.5)
Designation	House officer	Post Graduate Trainee/Resident	Specialist/ Consultant
	10(9.6)	77(74.3)	16(15.4)

When inquired about the frequent use of masks before vaccination, almost 100% showed a positive response. The predominant mask type used was surgical face mask, opted by ⅗ of the population, while KN-95 was opted by the rest. Most of the HCWs used single masks, and ¼ wore double masks. A vast majority of the participants were habitual of hand washing and sanitizing before vaccination. ⅖ of the population used PPE/Aprons/Gowns; the remaining didn't use them. Medical professionals widely followed social distancing as ⅕ replied positively, and avoiding social gatherings was commonly witnessed for that purpose.

After vaccination, the frequent use of masks was dropped by ¼ of the participants. A more significant number of individuals favored surgical masks and single layers of masks. Many HCWs also let go of hand washing and sanitizing as the positive responses decreased by ¼. Some individuals stopped avoiding social gatherings and didn't frequently practice social distancing.

TABLE II: FREQUENCY OF SAFETY USED BY CARE GIVERS BEFORE & AFTER VACCINATION

	Before vaccination (n)	**After vaccination (n)**	**P-Value**
Frequent use of masks	100	75	0.001
Frequent hand washing and sanitizing	95	75	0.000
Practice of social distancing	84	65	0.000
Avoidance of social gatherings	90	70	0.000

TABLE III: FREQUENCY OF HEALTH CARE WORKERS USING PRECAUTIONARY MEASURES POST VACCINATION

		Designation			
	After vaccination (n)	**House Office (n)**	**Consultant/ specialist (n)**	**Resident / trainee (n)**	**P-Value**
Frequent use of masks	75	10	16	49	0.000
Frequent hand washing and sanitizing	75	10	16	49	0.000
Practice of social distancing	65	8	16	41	0.000
Avoidance of social Gatherings	70	8	16	46	0.000

DISCUSSION

There has been ample research done on the hesitancy of HCWs towards vaccination. It has been pointed out that the hesitant group consists more of African and rural people[9], and vaccine hesitancy has seriously threatened coronavirus eradication[10].

This study is carried out to analyze the impact of vaccination on HCWs' attitudes towards preventive measures. To begin with, a correlation was found between vaccination for COVID 19 and frequent use of masks. There was a significant decrease in the number of individuals wearing masks before and after vaccination. When different preventive measures were analyzed, and the impact of vaccination was observed, the results showed a significant decrease in the frequency of masks worn, layers of masks, hand washing and sanitizing and practice of social distancing.

This shows that the vaccination led to ease in COVID-

19 restrictions and medical professionals are less cautious about preventive measures.

This predisposes them to different risks; the main risk is to the health of medical professionals[11], as they are present in a hospital setting and getting hospital-acquired diseases is quite common.

It's a medical professional's responsibility to spread awareness and advocate the preventive practices; the best way is to preach practice themselves.

Secondly, if the patient visiting the hospital will observe that the doctors are not wearing masks and following proper SOPs, why should they.

Moreover, a designation also significantly impacted the attitude towards preventive measures, as the senior consultants/specialist kept following COVID SOPs. At the same time, the medical trainees/ residents neglected the preventive measures.

A study by Saqlain M et al.[12] reported that the pharmacists were keener on following COVID SOPs than other HCWs. Furthermore, a recent study in Ethiopia highlighted a positive response of nurses toward preventive measures[13].

Though the health professionals are well ersed with COVID-19-related information and are the earliest group vaccinated for COVID 19 globally, vaccination has led to a relaxed state of mind and reduced the fear of getting infected.

CONCLUSION

COVID vaccination has been a breakthrough and is the savior of many lives. Vaccination has made life easy for HCWs, as negative trends are observed towards preventive measures. Moreover, the pandemic timeline and physical and mental well-being depreciation also played a crucial role in the ignorance of COVID-19 SOPs. Further research considering the bigger picture and considering the wholesome reasons would further signify the data added by this research. So let us all hope that the whole population gets vaccinated and the virus gets eradicated.

Ethical permission: Holy Family Hospital Rawalpindi, Department of Medicine letter No. MU1-071-15Mar21, Dated: 15-03-2021.

Conflict of Interest: There is no conflict of interest among the authors

Financial Disclosure / Grant Approval: No funding agency was used for this research.

DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Raza MR: Concept, design
Taj FA: Data collection
Mumtaz H: Manuscript writing
Ismail SM: Editing
Amjad R: Critical review
Ehsan H: Data collection

REFERENCES

1. Joseph B, Joseph M. The health of the healthcare workers. Indian J Occup Environ Med. 2016; 20 (2): 71-72. doi: 10.4103/0019-5278.197518.
2. Waris Nawaz M, Imtiaz S, Kausar E. Self-care of Frontline Health Care Workers: During COVID-19 Pandemic. Psychiatr Danub. 2020; 32(3-4): 557-562. doi: 10.24869/psyd.2020.557.
3. Mahalmani VM, Mahendru D, Semwal A, Kaur S, Kaur H, Sarma P et al. COVID-19 pandemic: A review based on current evidence. Indian J Pharmacol. 2020; 52(2): 117-129. doi: 10.4103/ ijp.IJP_310_20.
4. Chu DK, Akl EA, Duda S, Solo K, Yaacoub S, Schünemann HJ. COVID-19 Systematic Urgent Review Group Effort (SURGE) study authors. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. Lancet. 2020; 395(10242): 1973-1987. doi: 10.1016/ S0140-6736(20)31142-9.
5. Doherty M, Buchy P, Standaert B, Giaquinto C, Prado-Cohrs D. Vaccine impact: Benefits for human health. Vaccine. 2016; 34(52): 6707-6714. doi: 10.1016/j.vaccine.2016.10.025.
6. Mina MJ. Measles, immune suppression and vaccination: direct and indirect nonspecific vaccine benefits. J Infect. 2017; 74 (Suppl 1): S10 -S17. doi: 10.1016/S0163-4453(17)30185-8.
7. Meyer H, Ehmann R, Smith GL. Smallpox in the Post-Eradication Era. Viruses. 2020; 12(2): 138. doi: 10.3390/v12020138.
8. Thompson KM, Kalkowska DA. Review of poliovirus modeling performed from 2000 to 2019 to support global polio eradication. Expert Rev Vaccines. 2020; 19(7): 661-686. doi: 10.1080/14760584.2020.1791093.
9. Khubchandani J, Sharma S, Price JH, Wiblishauser MJ, Sharma M, Webb FJ. COVID-19 Vaccination Hesitancy in the United States: A Rapid National Assessment. J Community Health. 2021; 46(2): 270-7. doi: 10.1007/s10900-020-009 58-x.
10. Pierre Verger, Dimitri Scronias, Yves Fradier, Malika Meziani, Bruno Ventelou. Online study of health professionals about their vaccination attitudes and behavior in the COVID-19 era: addressing participation bias. Hum Vaccin Immunother. 2021; 17: 9: 2934-9. doi: 10.1080/21 645515.2021.1921523.
11. Ng K, Poon BH, Kiat Puar TH, Shan Quah JL, Loh WJ, Wong YJ et al. COVID-19 and the risk to health care workers: a case report. Annals of

internal medicine. 2020; 172(11): 766-7.
12. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z et al. Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. J Hosp Infect. 2020; 105(3): 419-423. doi: 10.1016/j.jhin.2020.05.007.
13. Tadesse DB, Gebrewahd GT, Demoz GT. Knowledge, attitude, practice and psychological response toward COVID-19 among nurses during the COVID-19 outbreak in northern Ethiopia, 2020. New Microb New Infect. 2020; 38: 100787.

AUTHOR AFFILIATION:

Dr. Muhammad Raheel Raza
Medical Officer
District Headquarters Hospital
Nankana Sahib, Punjab-Pakistan.

Dr. Furqan Ali Taj
Medical Officer:
RHC Kundian, Mianwali, Punjab-Pakistan.

Hassan Mumtaz *(Corresponding Author)*
Clinical Research Associate
Maroof International Hospital
Islamabad-Pakistan.
Email: hassanmumtaz.dr@gmail.com

Syed Muhammad Ismail
Dow University of Health Sciences
Karachi, Sindh-Pakistan.

Ramsha Amjad
Doctor of Physical Therapy (DPT)
Foundation University Islamabad (FUI)
Islamabad-Pakistan.

Hamza Ehsan
Doctor of Physical Therapy
Foundation University Islamabad (FUI)
Islamabad-Pakistan.