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ASSESSING THE PREVALENCE OF TYPHOID FEVER AT HAYATABAD PESHAWAR

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Abstract

Background: *Typhoid fever remains a significant public health issue in many developing countries, particularly in Pakistan. The disease is primarily transmitted through contaminated food and water, with inadequate sanitation and poor hygiene practices exacerbating its prevalence.*

Aim: This study aims to determine the current prevalence rate of typhoid fever in , Hayatabad, and of Hayatabad, Peshawar, as well as to identify demographic and environmental correlates associated with its incidence.

Methodology: *Data were collected from 120 individuals in the targeted areas using a random convenient sampling method. The study assessed reported and diagnosed cases of typhoid fever and analyzed factors such as age, gender, socioeconomic status, water quality, and sanitation facilities.*

Results: *This study aimed to assess the prevalence of typhoid fever, knowledge about the disease, and hygiene practices in a community in Hayatabad, Peshawar, Pakistan. A total of 120 participants, consisting of 80 males and 40 females, were selected using convenient sampling. The findings showed that 55 males and 28 females were diagnosed with typhoid, indicating a significant health burden in both genders. The study also highlighted critical knowledge gaps, with 60 males and only 18 females aware of typhoid's symptoms and transmission, underlining the need for targeted health education, particularly aimed at women. Hygiene practices were suboptimal across both groups, with only 18 males and 8 females following proper hygiene practices. Additionally, vaccination rates were low, with 18 males and 8 females vaccinated against typhoid. These findings emphasize the importance of*

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comprehensive public health strategies, including hygiene promotion, vaccination campaigns, and sanitation.

Conclusion: *The study underscores the urgent need for enhanced public health interventions aimed at improving sanitation, promoting hygiene practices, and addressing the socioeconomic determinants of health to effectively reduce the incidence of typhoid fever in Hayatabad, Peshawar.*

INTRODUCTION

The gram-negative Salmonella enterica serover typhi bacteria is the common cause of typhoid , a systemic illness [1] . Once it enters the bloodstream, this bacteria causes symptoms and invades numerous organs. When it enters the digestive system, an infected individual excretes it in their feces [2]. The illness is marked by a protracted fever, bacterial replication in the reticulo-endothelial system (RES), and severe inflammation of the small intestine's lymphoid organs [3] . In the tropics and subtropics, where the majority of fevers are caused by infectious agents, fever is the most frequent reason for consultation. In the early stages, typhoid fever typically manifests as a fever and headache without any localizing symptoms or diarrhea [4]

Typhoid fever is common among crowded and impoverished populations with inadequate sanitation and is transmitted through ingestion of water or food that has been contaminated by faeces or less commonly, urine of infected humans [5]. Although the cause of this is different—the majority of cases of typhoid fever are contracted overseas or from long-term carriers who handle food—typhoid fever is still an issue in developed nations . According to studies, salmonella can live for days in both sea and ground water and for months in tainted eggs [6]A five-year retrospective investigation found that patients of all age groups had a high prevalence of typhoid fever, as determined by the Widal test [7]

There are an estimated 12-33 million cases of typhoid fever worldwide, and although numbers can fluctuate, the disease is thought to be the cause of 190,000–600,000 fatalities annually [11]. The main regions of the world with the highest prevalence of typhoid fever are south-central and south-east Asia, according to studies and a WHO report [2]. According to a recent study conducted in Ethiopia, there is a significant incidence of typhoid fever cases; nevertheless, coordinated epidemiological surveillance is required to determine the actual disease burden.[8]

In low- and middle-income countries (LMICs), such as Ethiopia, where there is inadequate cleanliness, contaminated drinking water, and a low level of living, typhoid fever is a serious public health concern . A systemic sickness particular to humans, typhoid fever is brought on by water- and food-borne bacteria [9]. It can be difficult to distinguish typhoid fever from other febrile and gastrointestinal infections due to its wide range of clinical symptoms and signs, which include fever, nausea, vomiting, and stomach discomfort. Blood, bone marrow, or any other typically sterile site can be cultured as the "gold standard" diagnostic technique for typhoid fever. The sensitivity of culture-based diagnosis is limited, and clinical microbiology services are not generally accessible in endemic locations[10].

There are more than 22 million new cases worldwide each year, with 90% of the victims coming from south-east Asia. The annual number of reported cases of typhoid mortality is approximately 2,16,000 [11]. Because typhoid fever requires a lengthy healing period before returning to normal activities, it interferes with the normal life of those who have it [11] . According to a 2008 survey, among Asian countries, Pakistan and India had higher incidence rates of enteric fever than Indonesia, China, and Vietnam. A 2001 study conducted in Bangladesh revealed that typhoid fever was the most common febrile illness, accounting for approximately 72.7% of cases. In 2010 there was an endemic 54% of children in semi-urban parts of Bangladesh and Iran having typhoid fever, according to another study.[12]

More than one-third of patients with enteric fever have problems, and the condition is more commonly documented in children over five. According to estimates, Pakistan, India, and Indonesia had incidence rates among children ages 2 to 5 of573.2,340.1, and 148.7 per 100,000 persons annually, respectively. Pakistani children aged 2 to

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15 had 451.7 cases per 100,000 people annually. The south Asian countries (Pakistan and India) had far higher rates than the north-east and south-east Asian countries (Viet Nam, Indonesia, and China)

A number of hospital-based studies conducted across Pakistan have repeatedly reported a relatively high incidence of typhoid fever, particularly in the younger age groups, despite the lack of sufficient population-based data from the nation. Preschoolers have a significantly higher relative incidence of typhoid illness, according to information from Delhi. The purpose of this study was to determine the prevalence of pediatric typhoid fever in Quetta, Balochistan, Pakistan, as well as its seasonal change[13]

Pakistan is second in Southeast Asia for typhoid fever prevalence, while exact data on incidence and prevalence are unavailable. The primary hazards in Pakistan, particularly in Karachi, are inadequate sanitation standards, contaminated water sources, and underlying socioeconomic issues. Food and tainted water are the primary sources of Typhoid fever is contracted by ingestion of S. typhi and its patients[14]

Many low- and middle-income countries are home to the endemic strain of Salmonella enterica serovar Typhi, or S. Typhi. Worldwide, there were an estimated 11–21 million cases of typhoid fever in 2015, along with 148,000–161,000 related deaths . Improved access to and usage of the infrastructure supporting WASH (clean water, sanitation, and hygiene) as well as health education and vaccination are effective preventative measures. The World Health Organization (WHO) advises introducing vaccinations first in nations with the highest incidence of typhoid fever or the highest prevalence of S. Typhi that is resistant to antibiotics, and programmatic use of typhoid conjugate vaccines for typhoid fever control[15.]

The surveillance for typhoid fever, incidence estimates, and the status of the introduction of the typhoid conjugate vaccine between 2018 and 2022 are all included in this study. Since 2016, estimates of case numbers and incidence in ten countries have been guided by population-based research due to the limited sensitivity of routine surveillance for typhoid fever[15] According to an updated modeling study, there were 9.2 million (95% CI = 5.9–14.1) cases of typhoid fever and 110,000 (95% CI = 53,000–191,000) deaths from the disease worldwide in 2019. The WHO's South-East Asian (306 cases per 100,000 people), Eastern Mediterranean (187), and African (111) regions had the highest estimated incidences. Since 2018, there have been five nations with estimated high typhoid fever incidence (≥100 cases per 100,000 people per year): Zimbabwe, Nepal, Pakistan, Samoa [based on self-assessment], and Liberia[15 .]

The standard Austin study served as the foundation for the epidemiology of typhoid fever . According to recent figures, typhoid fever causes about 200 000 deaths worldwide each year, with 21 million cases . Prior to this, there were reports of 16 million cases and over 600,000 deaths from typhoid fever . In 2006, the World Health Organization (WHO) estimated that there were 16 to 33 million cases of the disease worldwide annually, with 500,000–600,000 deaths and a case fatality rate of 1.5%–3.8% [16 .] Typhoid fever kills more people than any other place in the world, accounting for 93% of cases worldwide. With 274 cases per 100,000 people, Asia has the highest regional frequency rate as well—five times higher than Latin America, which comes in second[16]

Southeast Asia has the third highest incidence rate of any region, with 110 cases per 100,000 people. Pakistan is contained within this area. Pakistan has the greatest typhoid fever incidence in the Indian subcontinent, with 451.7 cases per 100,000 people year, followed by India with 214.2 cases per 100,000 people annually [16]

Currently, it is estimated that typhoid fever causes 16 million infections and 600,000 fatalities worldwide each year. [7] A significant burden of typhoid fever affects the 5.5 billion individuals who live in low- and middle-income nations. [8] Over 2.6 million episodes of typhoid fever were estimated to have occurred globally in 2000, accounting for 216,000 deaths. Asians comprised the majority of victims, accounting for 90% of morbidity and mortality[17 .]

According to estimates, Pakistan had 493.5 cases of typhoid per 100,000 people in 2018, the highest prevalence among South Asian nations[18.] While there are several potential sources of infection, the most significant ones are sewage contamination of

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water supplies and person-to-person transmission through inadequate hygiene [19].

Typhoid fever is an uncommon disease in developed nations; most cases are either imported by emigrants or acquired abroad; the annual incidence is estimated to be 540 per 100,000, or roughly 17 million cases worldwide. According to a study done by Crump and his colleagues, there are at least 200 000 deaths and about 22 million cases of typhoid annually[20]. The medium incidence in other parts of Oceania, Latin America, the Caribbean, and Asia and Africa is 10 to 100 cases per 100,000 person years[20].

After the acute sickness, 3%–5% of individuals were found to become carriers of the pathogen . Over 2.16 million cases of typhoid were reported globally in 2000, with 216 000 fatalities recorded; Asia accounted for more than 90% of these cases' morbidity and mortality[21] . Waterborne infections can be decreased in rural areas by implementing health interventions such as adequate water and sanitation facilities[21].

While typhoid fever is widespread worldwide, most endemic nations have inadequate definitions of the disease's true impact. The actual impact of the disease in these areas is also influenced by the high prevalence of multidrug-resistant typhoid fever[22] . Multiple service provider levels underwent surveillance in order to more precisely assess the incidence of sickness and define the affected population. According to estimates, there are 13 cases of typhoid fever for every 100,000 people annually[22].

East Asia accounts for 93% of worldwide typhoid fever cases, and so has the greatest fatality rate. Asia also boasts the greatest regional frequency rate, with 274 instances per 100,000 people, five times higher than the second highest incidence in the region[23]. Third highest occurrence rate of any region is found in Southeast Asia, with an incidence of 110 cases/100,000 population[23] . Typhoid and often show up suddenly with same clinical symptoms and a five to twelve day incubation period. A mild course with fever linked to general malaise, stomach symptoms, roseola, perspiration, headache, anorexia, cough, weakness, sore throat, disorientation, and muscle soreness are only a few examples of the symptoms[24].

In Pakistan, regardless of age, it ranks as the fourth most common cause of death[25]. According to estimates, the incidence rates for children between the ages of two and five were 573.2, 340.1, and 148.7 per 100,000 people annually in Pakistan, India, and Indonesia, respectively. In Pakistan, among children aged 2 to 15, there were 451.7 cases for every 100,000 people annually. The south Asian nations of Pakistan and India had much greater rates than the north- and south-east Asian nations of Vietnam, Indonesia, and China[25].

Based on estimations, Pakistan had the highest prevalence of typhoid among South Asian countries in 2018, with 493.5 cases per 100,000 people.Citation 5 The number of cases in Pakistan increased dramatically when a new, broad outbreak of drug-resistant (XDR) typhi began in Hyderabad in 2016. The outbreak primarily affected the province of Sindh [26].

Since then, typhoid cases have been found in Hyderabad, Karachi, and other areas of the province of Sindh; by December 2018, over 5372 cases had been reported[27]. The current study was carried out to examine the impact of typhoid fever on various ethnic groups in Quetta, Baluchistan, as typhoid is a critical public health issue that causes a considerable degree of morbidity and mortality, especially in youngsters[28] The Provincial Disease Surveillance and Response Unit (PDSRU) recorded 5274 XDR S. typhi cases from 14 districts in Sindh between 2016 and December 2018, according to the World Health Organization (WHO). Among these were 76% of cases from Karachi, 27% from the Hyderabad area, and 4% from other Sindhi districts [29]. The local administration implemented control measures, however from 2017 to 2018, there was a noticeable increase in the number of reported cases[29]

In summary we conclude that the bacteria Salmonella enterica serovar Typhi is the cause of typhoid fever, a serious global health issue. High rates of morbidity and mortality are characteristic of this systemic infectious disease, especially in low- and middle-income nations where access to healthcare and proper sanitation is frequently lacking. Because the disease is mainly spread by tainted food and water, it poses a serious threat to public health in areas with inadequate cleanliness standards. Moreover typhoid fever has to be prevented,

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diagnosed, and treated with comprehensive measures because it is still a serious public health concern. Reducing the burden of this disease in disadvantaged groups globally requires addressing the underlying socio-economic determinants of health. Fighting the recurrence of typhoid fever in both endemic and non-endemic areas would require ongoing research into better diagnostic instruments and potent vaccinations

OBJECTIVE :

1. Determine the Prevalence Rate: To assess the current prevalence rate of typhoid fever in the , Hayatabad, and areas of Hayatabad, Peshawar by analyzing the number of reported and diagnosed cases over a specified period.
2. **Identify Demographic and Environmental Correlates:** To investigate the demographic characteristics (age, gender, socioeconomic status) and environmental factors (water quality, sanitation facilities) associated with the incidence of typhoid fever in the targeted areas.

LETRETURE REVIEW

Typhoid fever is a bacterial disease caused by bacterium Salmonella Typhi. The symptoms of typhoid fever may include high grade fever and constipation followed by diarrhoea, loss of appetite and rose spots. This disease is contacted through contaminated food and water. Large-scale epidemics caused by the disease have historically been brought on by the unhygienic conditions brought about by fast urbanization. Large-scale advancements in water, sanitation, and hygiene (WASH) have since helped to control typhoid fever in many parts of the world (Cutler and Miller, 2005). Nevertheless, in 2017, typhoid fever was estimated to have caused 10.9 million illnesses and 116,800 deaths globally, mostly in regions where WASH is not at its best (GBD 2017 Typhoid and Paratyphoid Collaborators, 2019). Typhoid control has traditionally relied on antimicrobial therapy; however, in the 1970s, multidrug resistance (MDR), which is defined as combined resistance to ampicillin, chloramphenicol, and co-trimoxazole, emerged, and over the last few decades, resistance to newer medications, such as azithromycin, fluoroquinolones, and third-generation cephalosporins, has been building[30]

Worldwide, there were an estimated 11–21 million cases of typhoid fever in 2015, along with 148,000–161,000 related deaths. Improved access to and usage of the infrastructure supporting WASH (clean water, sanitation, and hygiene) as well as health education and vaccination are effective preventative measures. The World Health Organization (WHO) advises introducing vaccinations in countries with the highest incidence of typhoid fever or the highest prevalence of S. Typhi that is resistant to antibiotics first, and then using typhoid conjugate vaccines programmatically to combat typhoid fever. The surveillance for typhoid fever, incidence estimates, and the status of the introduction of the typhoid conjugate vaccine between 2018 and 2022 are all included in this study. Since 2016, estimates of case numbers and incidence in ten countries have been guided by population-based research due to the limited sensitivity of routine surveillance for typhoid fever. According to a 2019 modeling research that was updated, 9.2 million[31]

Low-income and middle-income countries (LMICs) with limited access to clean water, sanitation facilities, and hygiene are particularly vulnerable to the significantmorbidityand mortality caused by typhoid fever. Typhoid causes between 12.5 million and 16.3 million cases, as well as 140,000 fatalities annually.South Asia and sub-Saharan Africa are the areas most impacted.

The Typhoid Fever Surveillance in Africa Program (TSAP), which examined typhoid fever at 13 locations throughout ten African nations, found that there was a high prevalence of Salmonella spp. infection in both urban and rural environments, with significant site-to-site heterogeneity. Typhoid conjugate vaccines (TCVs) should be introduced in typhoid-endemic countries, according to a WHO position paper that incorporated data from TSAP and other comparable prospective surveillance studies(32)

There have been reports of 7.5 million cases and 79 000 annual deaths from typhoid fever in South Asia, which has the greatest incidence. While travel-related instances of typhoid fever can occur, the disease is not endemic in wealthy nations in Western Europe, North America, or Asia-Pacific. South Asia

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is probably the primary source of the majority of the 700–1400 cases that are reported annually in high-income nations.[33]

Consuming food or water tainted with feces can also result in typhoid infection. It is a serious health concern in areas without adequate water systems. Typhoid fever causes 22 million new cases worldwide each year, with 200,000 deaths. culminating in demise. Southeast Asia and Central South Asia report many annual 100 cases for every 100,000 individuals. Pakistan is a country with a high prevalence of 451.7 cases per 100,000 people annually, as opposed to 214.2 cases per 100,000 people in India [34]

Typhoid, which is caused by Salmonella typhi, and paratyphoid fever, which is caused by Salmonella paratyphi, rank 11th through 14th among the world's major causes of morbidity and death since 1990, according to the 2019 Global Burden Report1. It has been demonstrated that patients ages 0–9 are more susceptible than those ages 10–241,. Almost 12.5 million cases worldwide, or more than 87% of all cases, were from developing nations.[35]

Typhoid causes between 12.5 million and 16.3 million cases, as well as 140,000 fatalities annually.1. South Asia and sub-Saharan Africa are the areas most impacted.

The Typhoid Fever Surveillance in Africa Program (TSAP), which examined typhoid fever at 13 locations throughout ten African nations, found that there was a high prevalence of Salmonella spp. infection in both urban and rural environments, with significant site-to-site heterogeneity. Typhoid conjugate vaccines (TCVs) should be introduced in typhoid-endemic countries, according to a WHO position paper that was influenced by data from TSAP and other comparable prospective surveillance studies.[36]

Meanwhile, typhoid disease causes 128,000–161,000 deaths annually, striking between 11 and 21 million people worldwide . Large areas of Asia, Africa, and Latin America are affected by its prevalence, which is made worse by poor sanitation and limited access to drinkable water. Evidence indicates that typhoid and malaria can present simultaneously in a patient, despite the fact that they have historically been examined separately. This could exacerbate symptom severity, prolong recovery, and increase the chance of death.[37]

According to estimates, typhoid causes 21.7 million infections and 217,000 deaths worldwide each year. In contrast to the prior estimate of 16 million illnesses and 600,000 deaths documented 16 years ago, 21.6 million illnesses and 216,510 fatalities were reported globally in 2000. The 20% increase in the world population from 4.8 billion to 6.1 billion people may have contributed to the rise in the burden of typhoid fever worldwide.[38]

There are several risk factors for the importation and local spread of highly drug-resistant Typhi strains and XDR within the 22 different countries and territories that make up the WHO Eastern Mediterranean Region (EMR), home to over 700 million people. WHO EMR comprises 22 countries and territories: seven Middle Eastern countries (Iran, Iraq, Jordan, Lebanon, Palestinian territory, Syria, Yemen); seven North African countries (Djibouti, Egypt, Libya, Morocco, Somalia, Sudan, Tunisia); six Arab states of the Persian Gulf (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates); and two South Asian countries (Afghanistan, Pakistan).[39]

The prevalence of typhoid fever, which is caused by Salmonella enterica serovar Typhi (S. Typhi), has decreased by half globally over the past 30 years as a result of widespread use of efficient medicines and advancements in water and sanitation. Still, 10.9 million infections and 117 000 deaths were reported worldwide in 2017, with the majority of those cases occurring in Africa and south and southeast Asia. [40]

Typhoid fever cases in non-endemic countries are few and mainly sporadic, with little impact on public health; the annual incidence in the Netherlands over the last ten years was 0.11 cases per 100,000 inhabitants, and in the European Union/European Economic Area (EU/EEU) countries it was 0.19 cases per 100,000, with 90.9% of cases being travel-related. The World Health Organization (WHO) estimates the yearly number of cases to 11–20 million, resulting in approximately 128,000–161,000 deaths yearly. The Indian subcontinent, Southeast Asia, and sub-Saharan Africa have the highest incidences.[41]

200,000 people die from typhoid fever each year, mostly in developing nations, out of the roughly 25

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million cases that occur globally.Kut's downtown is home to Wasit University, which is situated in the Wasit Governorate. determination of Salmonella in Al Kut city.

It has never been determined if healthy individuals have antibodies against Salmonella paratyphi and typhi in addition to this investigation was carried out to diagnose both acute and chronic infections in this location.[42]

Typhoid fever is a nationally notifiable disease in Tunisia, with an average of 35 sporadic cases recorded annually and a low national incidence of 0.32 cases per 100,000 people in the last five years. It is still endemic to epidemic, particularly in rural regions with poor access to clean water and sanitation. Typhoid fever cases are twice reported from the periphery to the regional and finally to the central levels, and any clustered cases or epidemic events are promptly reported and investigated as part of this monitoring system.[43]

In July 2016, we conducted our study in Ghannouche, a tiny city in southern Tunisia, where more than a dozen confirmed cases of typhoid fever were reported. The epidemic notice was issued due to this high number, which is higher than the normal number of cases recorded nationally each year. In response to this alarm, a combined fast reaction team was organized, a crisis unit was formed at the regional and central levels, and field research was conducted to determine the outbreak's possible cause as well as to put control and preventive measures in place.

In order to provide early and effective control measures, the current study summarizes the findings of the epidemiologic and environmental inquiry carried out to determine the determinants and risk factors connected with this outbreak.[44]

Typhoid is most common in Pakistan, out of all the adjacent countries; in 2018, there were 493.5 cases per 100,000 people.3- The nation's position of 35.84% availability of clean water in 2020 belies its problems with overcrowding, poor sanitation and healthcare, and limited access to clean water.Four The disease spreads due to inadequate infrastructure for sanitation, hygiene, and water, as well as deteriorating living circumstances that allow food and water supplies to become contaminated with bacterial excrement.[45]

The World Health Organization (WHO) reports that there are 11–20 million typhoid cases worldwide, with a death toll of 128,000–161,000 every year. Bangladesh, among numerous other countries, is severely affected, with annual incidence rates of 252 per 100,000 affected individuals.[46]

One in six cases of enteric fever in Bangladesh, a nation with a particularly high incidence of the disease, is caused by Salmonella Paratyphi A, and this percentage of cases of paratyphoid fever has remained stable over the past 20 years[47].

Out of an estimated 9 million annual infections, the World Health Organization (WHO) estimates that 110,000 people die from TyF each year. The disease is common in many third-world countries, especially those with poor sanitation and limited access to clean water. Such regions include Bangladesh, South Asia, India, and Pakistan, which are most impacted[48].

Typhoid fever is a common disease in Pakistan as well, affecting 451.7 people per 100,000 annually. In developed countries, enteric fever has been significantly reduced by improvements in sanitary infrastructure. In lower-middle-income countries (LMICs), the misuse of antibiotics for treating S. typhi has led to an increase in antibiotic resistance, endangering global public health. The mortality rate from S. typhi has also increased, which is attributed to antibiotic resistance. S. typhi strains resistant to antibiotics like ampicillin, chloramphenicol, trimethoprim–sulfamethoxazole, fluoroquinolones, and third-generation cephalosporin are referred to as extended drug-resistant (XDR)[49].

Additionally, an XDR typhoid outbreak happened in Sindh, Pakistan, in 2016. The frequency of positive S. paratyphi A cultures increased from 0.2% in 2017 to 0.3% in 2018, then to 0.9% in 2019. This increase in positive cultures suggested a national spread of XDR typhoid fever outside of Sindh. Given the pressure that the coronavirus disease 2019 (COVID-19) is putting on the healthcare system, it is anticipated that the preexisting and rising burden of XDR typhoid would deteriorate in the absence of proactive and effective treatments. Thanks to immunization, the incidence of illnesses, impairments, and fatalities has drastically decreased[50].

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Typhoid is most common in Pakistan, out of all the adjacent countries; in 2018, there were 493.5 cases per 100,000 people. As of 2020, the nation ranks 35.84% of the world in terms of clean water availability. Other problems include overcrowding, poor sanitation and healthcare, and limited access to clean water[51].

According to reports, Pakistan has an annual typhoid incidence per 100,000 person-years of 573.2 cases among children ages 2-4 and 412.9 cases among children ages 5-15 [52].

Health officials in Pakistan have verified that between 2016 and 2020, there were around 22,354 instances of typhoid fever reported; of these, 15,717 cases were extensive drug-resistant cases from various districts in Sindh[53].

The first case of an XDR strain of typhoid, which originated in Sindh, Pakistan, was reported toward the end of 2016. According to the first reports, it was related to the large number of cases of typhoid fever that were confirmed by blood culture and showed resistance to conventional treatment.6. The largest metropolis and capital of Sindh province, Karachi, had 14,360 cases of XDR-typhoid fever between 2016 and 2021, according to the National Institute of Health's (NIH) Islamabad Weekly Field Epidemiological Report. Excluding Karachi, a total of 5,741 confirmed cases of XDR-typhoid were reported in all remaining districts of Sindh during a similar timeframe that ran from November 2016 to June 2021. 69.5% of those cases originated in the district of Hyderabad. According to the World Health Organization's (WHO) recommended recommendations, Pakistan consequently took the lead in introducing the typhoid conjugate vaccine into its regular pediatric immunization program[54].

A broad outbreak of Salmonella enterica serovar Typhi that was extensively drug-resistant (XDR) and resistant to third-generation cephalosporin was documented in Sindh Province, Pakistan, in November of 2016. Treatment for XDR typhoid is limited to azithromycin and carbapenems. Azithromycin susceptibility and resistance have decreased in Bangladesh; 32 out of 2519 isolates of S Typhi that were identified between October 2016 and July 2018 were found to be resistant to the antibiotic. Drug-resistant S Typhi infections increase morbidity and death, and they also have an economic impact since they require longer hospital stays and more expensive treatment. Typhoid vaccinations are on the World Health Organization's list of necessary medications for priority diseases because drug-resistant variants of the disease are becoming more common in endemic areas[55].

In summary we conclude that a serious worldwide health concern, typhoid fever is brought on by the Salmonella Typhi bacteria and is most common in low- and middle-income countries (LMICs) with poor sanitation and hygiene. A high temperature, gastrointestinal problems, an appetite loss, and rose patches are some of the symptoms of the disease, which is mainly spread by contaminated food and drink.

Typhoid fever has historically been associated with inadequate urban sanitation, with widespread epidemics happening during times of rapid urbanization. The disease is still common, with an estimated 10.9 million cases and 116,800 deaths recorded in 2017 despite improvements in the infrastructure related to water, sanitation, and hygiene (WASH). Sub-Saharan Africa and South Asia are the areas most impacted.

The conventional approach to treatment has been the use of antibiotics; but, since the 1970s, the advent of multidrug-resistant (MDR) bacteria has confounded care. Azithromycin and fluoroquinolones are two examples of more recent antibiotics that are becoming less effective. Improving access to sanitary facilities and clean water, immunisation, and health education are examples of preventive interventions. In high-incidence areas, the World Health Organization (WHO) recommends focused immunization campaigns as an efficient means of containing the disease. In order to estimate incidence rates and direct public health interventions from 2018 to 2022, surveillance and population-based research have been crucial.

Material and Methods

3.1 Ethical Considerations

Hayatabad Medical Complex (HMC), Rehman Medical Institute (RMI), Pakistan Institute of Medical Sciences (PIMS), North West General Hospital (NWGH), and Peshawar General Hospital (PGH)

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3.2 Study Design

This research is convenient a study aimed at assessing the prevalence of typhoid fever in , Hayatabad, and , located within Hayatabad, Peshawar. The study was conducted over a period of 6 to 8 months, during which data was collected from residents using convenient sampling. The convenient sampling was chosen as it allows for the collection of data at a single point in time, making it possible to analyze the prevalence of the disease and associated factors in the community.

3.3 Study Population

The study population consisted of residents of Hayatabad, and , selected from various demographic backgrounds. A total of 120 individuals were recruited, with 80 males and 40 females participating in the study. Participants were chosen based on their availability and willingness to contribute to the research. The age range of the participants was between 18 to 60 years.

3.4 Sampling Method

Convenient sampling was employed to select the participants for this study. This method was chosen due to its ease of implementation and the logistical challenges of conducting a systematic random sampling method in rural areas. The sample was drawn in a way that ensured representation across different socioeconomic classes and age groups, minimizing the risk of bias. Although convenient sampling may have its limitations, efforts were made to include participants from diverse backgrounds to increase the generalizability of the findings.

3.5 Inclusion Criteria

- Residents who have lived in Hayatabad, or for at least one year.
- Individuals aged [18 to 60 years], both male and female.
- Participants who provided informed consent to participate in the study.

3.6 Exclusion Criteria

- Individuals who had resided in the study area for less than six months.
- People with a history of severe illnesses other than typhoid, as this could confound the results.
- Participants who declined to provide consent or could not be reached during the data collection period.

3.7 Data Collection

Data was collected through a structured questionnaire designed specifically for this study. The questionnaire included a combination of both closed-ended and open-ended questions. It was developed after a thorough review of the literature to ensure that all relevant aspects of typhoid prevalence were covered. The questionnaire was divided into four sections:

1. **Demographic Information:** Age(18 to 60 years), gender, education level, and knowledge,.
2. **Health History:** Questions related to prior experiences with typhoid fever, including diagnosis and treatment.
3. **Hygiene Practices:** Assessment of hand hygiene practices, water consumption habits, and the use of sanitation facilities.
4. **Symptomatology:** Participants were asked about common symptoms of typhoid fever, such as fever, abdominal pain, diarrhea, and vomiting.

Data collection was done face-to-face by trained interviewers to ensure accuracy and reliability. Any incomplete or ambiguous answers were clarified on the spot to avoid missing data.

3.8 Statistical Analysis

The data collected was entered and analyzed using [SPSS version X, Excel]. Descriptive statistics such as means, frequencies, and percentages were used to summarize the demographic characteristics of the participants, hygiene practices, and the reported symptoms of typhoid fever. Inferential statistics, including chi-square tests, were applied to determine the relationship between variables such as gender, hand hygiene practices, and typhoid prevalence. A p-value of less than 0.05 was considered statistically significant in this study. The results were presented in tables and graphs for clarity and ease of interpretation.

3.9 Limitations

While this study provides valuable insights into the prevalence of typhoid in Hayatabad, Peshawar, there are certain limitations. The use of random

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convenient sampling may not fully represent the entire population of the region, and recall bias could have influenced participants' responses, particularly regarding past medical history and hygiene practices.

RESULTS

The study collected data through random convenient sampling from 120 participants, including both males and females. Of the total sample, 80 were males and 40 were females. This approach allowed for a balanced representation of the community, providing insights into the prevalence of typhoid, awareness of the disease, and hygiene practices among the participants.

When looking at the prevalence of typhoid in the male population, it was found that 55 out of 80 males (68.75%) had been diagnosed with typhoid, while 25 males (31.25%) were confirmed not to have the disease. The high number of typhoid cases among males suggests a need for targeted health interventions, as the disease appears to be widespread in this group. This significant proportion of males affected by typhoid reflects a public health concern that needs to be addressed.

In the female population, the study revealed that 28 out of 40 females (70%) had been diagnosed with typhoid, while 12 females (30%) did not have the disease. The prevalence of typhoid in females is slightly higher compared to males, but the difference is not substantial. These results indicate that typhoid is a major health issue affecting both males and females in the community. With nearly 70% of both groups affected by the disease, it underscores the urgent need for public health strategies focused on prevention and control.

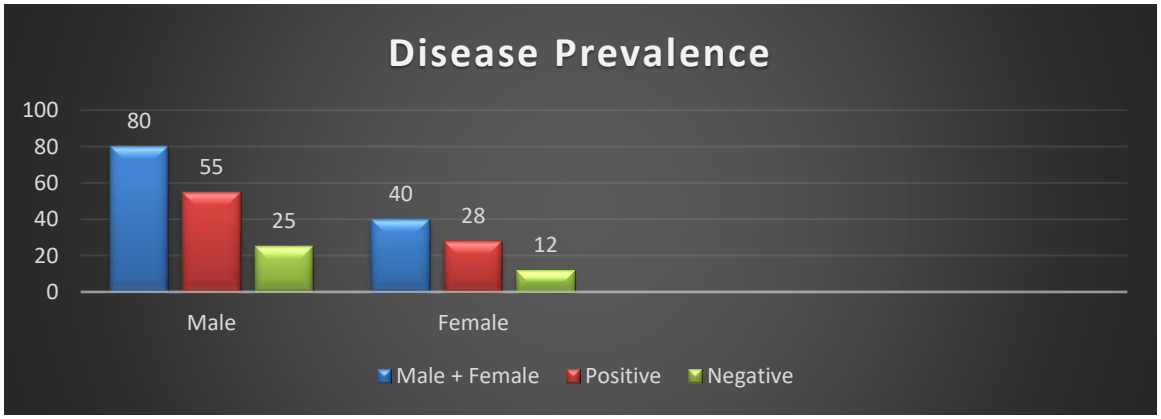
Table 4.1

Disease Prevalence Table:

This table summarizes the prevalence of typhoid among the surveyed participants in Hayatabad, Peshawar, categorized by gender. The data indicates a significant burden of the disease within both male and female populations.

Tableb 4.1

	Total Participants	Typhoid Positive	Typhoid Negative
Males	80	55(68.75%)	25(31.75%)
Females	40	28(70.00%)	12(30.00%)
Total	**120**	**83(69.17%)**	**37(30.83%)**



In table 4.2 the study also investigated participants' knowledge about typhoid, as awareness is critical in disease prevention and management. Among the males, 60 out of 80 (75%) had knowledge about typhoid, understanding what the disease is, how it spreads, and its symptoms. This relatively high level of awareness is encouraging, as it shows that a significant portion of males are informed about the

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disease. However, 20 males (25%) had no knowledge of typhoid, which highlights a gap in health education that must be addressed. Ensuring that all community members have access to accurate health information is essential for controlling the spread of typhoid and encouraging preventive behaviors.

Among the females, only 18 out of 40 (45%) were aware of what typhoid is, while a larger proportion, 22 females (55%), reported having no knowledge of the disease. This is a concerning finding, as it shows that more than half of the female participants lacked basic information about typhoid. This significant knowledge gap may contribute to the spread of the disease among females, as those who are unaware of how the disease spreads or its symptoms may be less likely to take preventive measures or seek treatment early. The lower level of awareness among females compared to males suggests that health education efforts may not be reaching women effectively, possibly due to social or cultural barriers that limit women's access to health information.

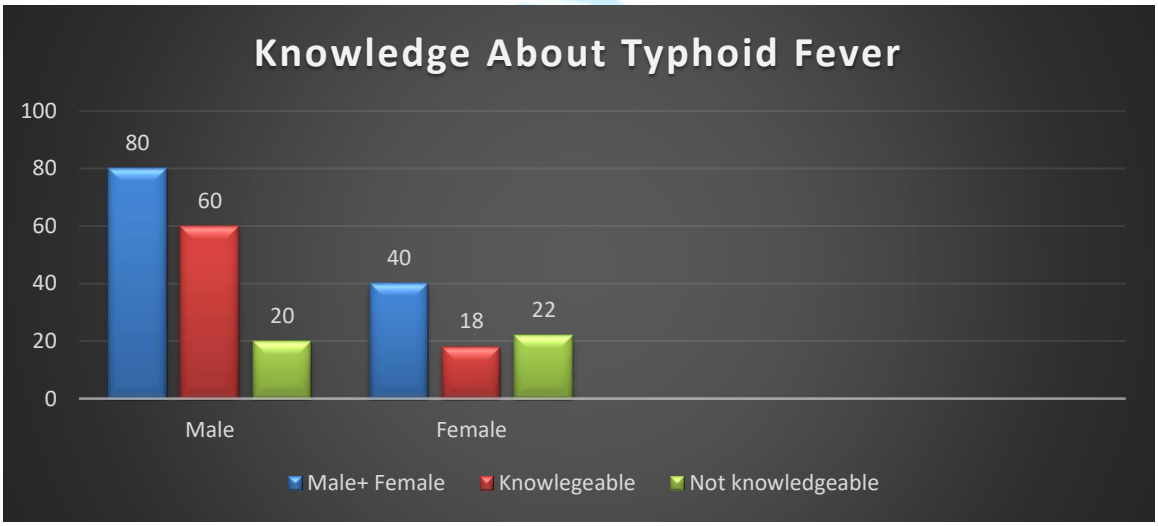
Table 4.2

Knowledge About Typhoid Fever:

This table highlights the overall knowledge of participants regarding typhoid, emphasizing the importance of health education in combating the disease.

Table 4.2

Gender	Total Participants	Knowledgeable	Not Knowledgeable
Males	80	60(75.00%)	20(25.00%)
Females	40	18(45.00%)	22(55.00%)
Total	**120**	**78(65.00%)**	**42(35.00%)**



In addition table 4.3 is to examining the prevalence of typhoid and knowledge about the disease, the study also looked at participants' hygiene practices, which are crucial in preventing the spread of typhoid. Among the male participants, only 18 out of 80 (22.5%) followed proper hygiene practices, such as washing their hands regularly with soap and clean water. This low rate of hygiene practice among males is concerning, as good hand hygiene is one of the most effective ways to prevent the spread of communicable diseases like typhoid. The remaining 62 males (77.5%) did not practice proper hygiene, which may be a significant factor contributing to the high prevalence of typhoid in the male population.

Similarly, the female participants also showed poor hygiene practices. Only 8 out of 40 females (20%) reported following proper hygiene measures, while the vast majority, 32 females (80%), did not adhere

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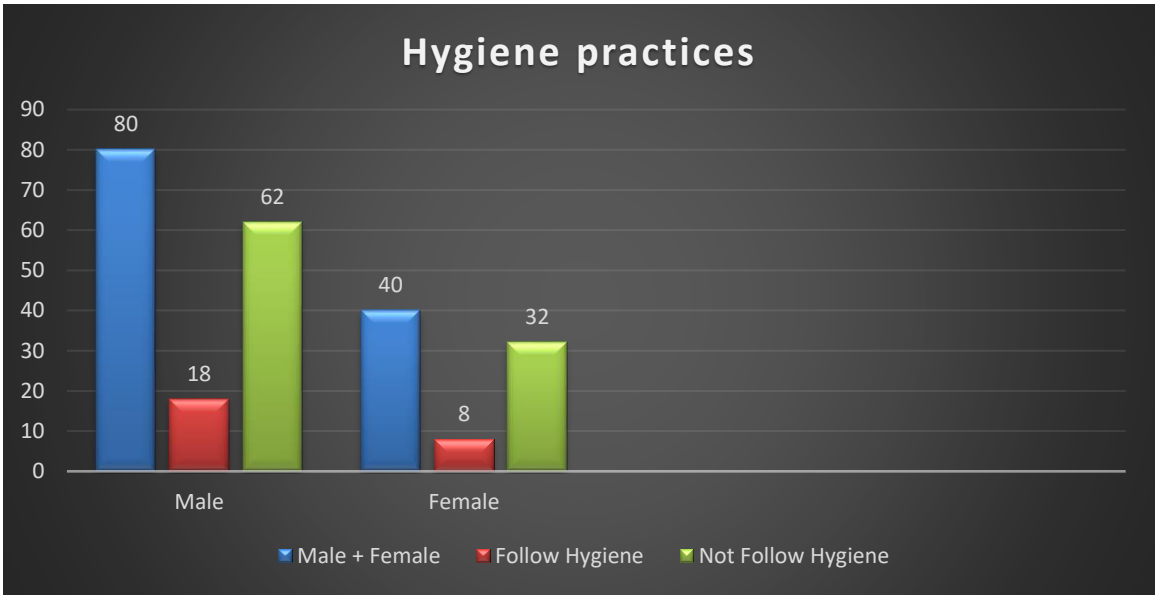
to recommended hygiene practices. This is an alarming finding, as it suggests that poor hygiene practices are widespread among both males and females in the community. The lack of hygiene among females may be linked to the high prevalence of typhoid, as the disease is often transmitted through contaminated food and water, which can result from inadequate sanitation and hygiene practices.

Table 4.3

Hygiene Practices Table:

This table summarizes the hygiene practices of the participants, which are crucial for preventing the spread of typhoid. Adherence to hygiene practices is vital for public health.

Gender	Total Participants	Follow Hygiene	Do Not Follow Hygiene
Males	80	18(22.50%)	62(77.05%)
Females	40	8(20.00%)	32(80.00%)
Total	**120**	**26(21.67%)**	**94(78.33%)**



The findings of this study highlight several important issues that need to be addressed in order to control the spread of typhoid in the community. First, the high prevalence of typhoid among both males and females indicates that the disease is a major public health concern. The fact that nearly 70% of the participants in both groups were diagnosed with typhoid shows that urgent action is needed to reduce the number of cases and prevent further spread.

Second, the study revealed significant gaps in knowledge about typhoid, particularly among females. While 75% of males had a good understanding of the disease, only 45% of females were aware of typhoid and its symptoms. This lack of awareness among women is concerning, as it suggests that they may be less likely to take preventive measures or seek timely medical treatment. Addressing this knowledge gap should be a priority for public health interventions, as increasing awareness about typhoid can help reduce the number of cases and improve health outcomes for both males and females.

Third, the study showed that poor hygiene practices are common among both males and females. The fact that only 22.5% of males and 20% of females followed proper hygiene measures highlights the need for hygiene promotion programs in the

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community. Hand hygiene, in particular, is a simple and effective way to prevent the spread of typhoid and other communicable diseases. Public health campaigns that focus on educating the community about the importance of handwashing with soap and clean water could significantly reduce the transmission of typhoid and improve overall health outcomes.

To address the high prevalence of typhoid, low levels of awareness, and poor hygiene practices, comprehensive public health strategies are needed. These strategies should include both prevention and treatment measures, as well as efforts to increase awareness about the disease. One key approach is to implement health education programs that target both males and females, but with a special focus on women, who showed a lower level of awareness about typhoid. These programs should aim to educate the community about how typhoid is transmitted, its symptoms, and how to prevent it through good hygiene and vaccination.

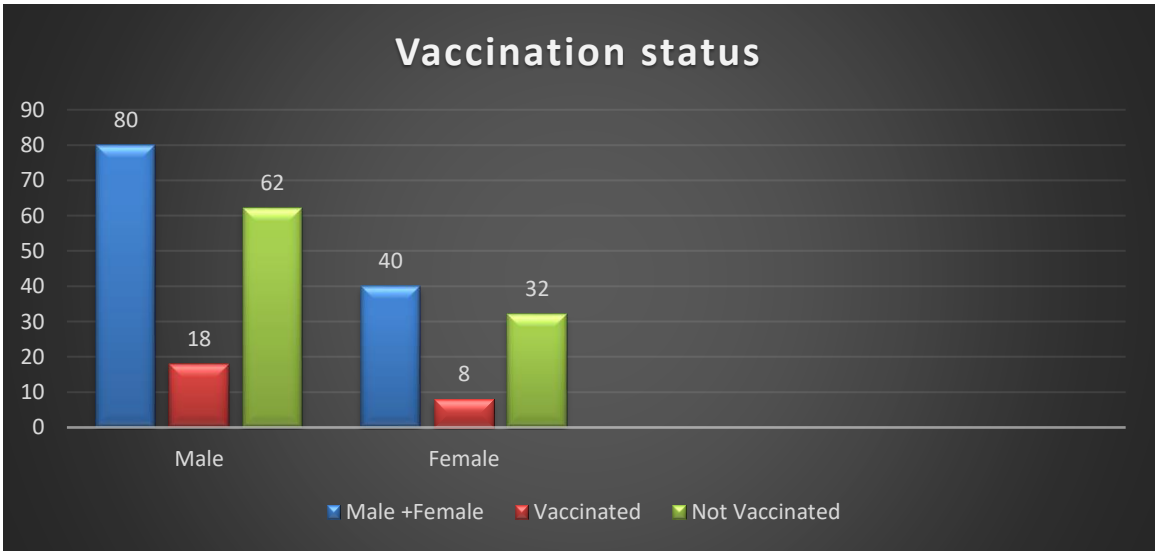
In addition to education, improving access to clean water and sanitation facilities is crucial for preventing the spread of typhoid. Typhoid is often transmitted through contaminated water and food, so ensuring that the community has access to safe drinking water and proper sanitation facilities can help reduce the number of

cases. Public health authorities should work with local governments and community leaders to improve water and sanitation infrastructure, particularly in areas where typhoid is most prevalent. In 4.5 table vaccination is another important preventive measure that can help reduce the spread of typhoid. The low vaccination rates observed in the study—only 22.5% of males and 20% of females had been vaccinated—suggest that there is a need for increased efforts to promote typhoid vaccination in the community. Public health campaigns that encourage vaccination and provide easy access to vaccines can help protect individuals from the disease and prevent future outbreaks.

Table 4.5
Vaccination Status:

Gender	Total Participants	Vaccinated	Not Vaccinated
Males	80	18(22.50%)	62(77.50%)
Females	40	8(20.00%)	32 (80.00%)
Total	**120**	**26(21.67%)**	**94 (78.33%)**

Table 4.5



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In summery this study provides valuable insights into the prevalence of typhoid, knowledge about the disease, and hygiene practices among males and females in the community. The findings highlight the urgent need for public health interventions that focus on increasing awareness, promoting hygiene, and improving access to clean water and sanitation. By addressing these key issues, it is possible to reduce the number of typhoid cases and improve health outcomes for the entire community. Public health authorities, healthcare providers, and community leaders must work together to implement comprehensive strategies that prevent the spread of typhoid and protect the health of both males and females.

DISCUSSION

The research study conducted in Hayatabad, and of Hayatabad, Peshawar provides significant insights into the prevalence of typhoid fever, awareness about the disease, hygiene practices, and vaccination status among community members. The findings reveal crucial public health concerns that highlight the need for comprehensive interventions to control the spread of typhoid in these areas.

The data clearly show that typhoid is a serious public health issue affecting a large proportion of the population, with 68.75% of males and 70% of females diagnosed with the disease. This high prevalence in both genders suggests that the disease is pervasive in the community, likely due to common environmental risk factors, such as poor water quality, inadequate sanitation, and contaminated food sources. Similar research Typhoid fever is a major public health concern in Ethiopia, where living conditions are poor, drinking water is contaminated, and sanitation is inadequate([9]) .The near-equal prevalence between males and females indicates that exposure to the conditions that facilitate the spread of typhoid is similar for both groups, underscoring the need for community-wide interventions that address the root causes of the disease.

An interesting finding is the discrepancy in awareness between genders. While 75% of males were knowledgeable about typhoid, only 45% of females reported awareness of the disease. This significant gender gap in knowledge highlights a critical issue in health education and information dissemination. Women, despite being slightly more affected by typhoid than men, appear to have less access to information regarding the disease's causes, symptoms, and prevention methods. This lack of awareness among women could have serious implications, as they play a central role in household health management, food preparation, and caregiving. Increasing health literacy among females through targeted education programs is vital to improving overall community health. These programs should focus on providing women with the necessary information and tools to recognize the symptoms of typhoid and take preventive measures, such as promoting better hygiene and seeking timely medical care.

The study also highlights poor hygiene practices as a key factor contributing to the spread of typhoid. A study conduct also , the illness is widespread in many third-world nations, particularly those with inadequate access to clean water and sanitary conditions([48]). Among the male participants, only 22.5% reported following proper hand hygiene, while an even lower percentage (20%) of females practiced good hygiene. The widespread lack of hygiene adherence among both genders is concerning, as proper handwashing with soap and clean water is one of the most effective ways to prevent the spread of typhoid, which is often transmitted via the fecal-oral route through contaminated water or food. These findings point to the urgent need for hygiene promotion campaigns that emphasize the importance of handwashing and safe sanitation practices. Such campaigns should aim to raise awareness about the critical role hygiene plays in preventing communicable diseases, including typhoid, and should be implemented at both individual and community levels. Additionally, improving access to clean water and proper sanitation facilities is essential to enabling people to adopt and maintain proper hygiene practices.

Vaccination rates in the community were also found to be extremely low, with only 22.5% of males and 20% of females vaccinated against typhoid. This low vaccination coverage poses a serious risk for ongoing transmission of the disease, especially in an area with such a high prevalence. Vaccination is a proven and effective method to prevent typhoid, and increasing

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the community's access to vaccines should be a top priority. Public health campaigns that encourage vaccination and dispel myths or misinformation about vaccines are crucial. Additionally, integrating vaccination efforts with routine health services and improving vaccine distribution channels in remote areas like Hayatabad, and can help increase coverage.

In summary, the study presents a troubling picture of the typhoid situation in Hayatabad, Peshawar, where high prevalence, low awareness, poor hygiene practices, and inadequate vaccination coverage all contribute to the continued spread of the disease. Addressing these challenges requires a multi-dimensional public health approach. First, there is a need to enhance community health education, particularly focusing on increasing awareness among females, who demonstrated a significant knowledge gap. Second, promoting hygiene practices through education and ensuring access to clean water and sanitation are critical to breaking the cycle of typhoid transmission. Finally, expanding vaccination coverage through targeted campaigns and improved access will be essential in reducing the overall burden of typhoid in the community.

By implementing these strategies, the local health authorities and community leaders can make significant strides in controlling the spread of typhoid and improving the health and well-being of the population in Hayatabad, Peshawar.

CONCLUSION

This research aimed to investigate the prevalence of typhoid fever in Hayatabad, Peshawar, with a specific focus on Hayatabad, and . The study found a significant association between the prevalence of typhoid and poor hygiene practices, particularly in the realm of hand hygiene. Out of the 80 male participants, only 12 (15%) reported practicing proper hand hygiene, while among the 40 female participants, only 8 (20%) adhered to adequate handwashing standards. These figures are alarmingly low, indicating a substantial gap in basic hygiene practices, which are essential in controlling the spread of communicable diseases like typhoid.

The lack of proper hand hygiene is a critical factor contributing to the spread of typhoid in these regions. This is compounded by other environmental and socio-economic factors such as limited access to clean water, inadequate sanitation facilities, and low health literacy. The study's findings align with existing literature, which consistently points to poor sanitation and hygiene practices as major drivers of typhoid transmission in underdeveloped areas.

Furthermore, the prevalence of typhoid in Hayatabad, Peshawar reflects a broader public health challenge that necessitates urgent intervention. Public health education campaigns that focus on the importance of hand hygiene, safe water consumption, and proper food handling practices should be prioritized. Community outreach programs, particularly in rural and underserved areas, can raise awareness and encourage behavior change.

In addition, the study highlights the need for infrastructural improvements, particularly in terms of water supply and sanitation. Ensuring access to clean drinking water and improving waste management systems are crucial steps in reducing the risk of typhoid transmission. Immunization campaigns should also be strengthened, as the typhoid vaccine remains an effective tool in preventing outbreaks, especially in high-risk areas.

In conclusion, while this study sheds light on the prevalence of typhoid and the role of hygiene practices in its transmission, it also calls for comprehensive and multifaceted public health strategies. Future research should focus on exploring other risk factors, such as food safety and community-level socio-economic determinants, and assess the effectiveness of targeted intervention programs. By addressing both the behavioral and structural factors contributing to typhoid, a substantial reduction in disease incidence can be achieved in Hayatabad, Peshawar and beyond.

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