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Pakistan's Climate Crisis: A Call for Urgent Action

Pakistan is one of the five countries in the world affected most due to climate change in last two decades. This vulnerability arises primarily from Pakistan's geographical location, heavy reliance on agriculture and water resources, limited ability to adapt to changes among its population, and an inadequate system for responding to emergencies. Pakistan faces several climate-related dangers, including floods, which bring the risk of diseases like diarrhea, gastroenteritis, skin infections, eye infections, acute respiratory infections, and malaria. Droughts also heighten health concerns such as food insecurity, malnutrition, anemia, night blindness, and scurvy. Additionally, increasing temperatures pose threats like heat stroke, malaria, dengue fever, respiratory diseases, and cardiovascular conditions.

The year 2022 stands out as a chilling testament to the devastating impacts of climate change on Pakistan's health and infrastructure. Catastrophic flooding submerged nearly one-third of the country, impacting 33 million people, half of whom were innocent children. The floods wreaked havoc on critical water systems, forcing more than 5.4 million people to rely on contaminated water from ponds and wells. The consequences

were catastrophic, with 1,730 lives lost, 8 million individuals displaced, and exposure to diseases and under-nutrition. The aftermath of the 2022 floods remains a haunting reminder of Pakistan's inadequacies in emergency preparedness.

The repercussions of these floods continue to reverberate throughout Pakistan. Post-disaster assessments paint a grim picture, with an estimated 8.4–9.1 million people pushed below the poverty line. More than 2.5 million people lack access to safe drinking water, while Malaria outbreaks are reported in at least 12 districts in Sindh and Balochistan. With over 7 million children and women urgently needing access to nutrition services, Pakistan's humanitarian crisis is acute.

The urgency of the situation cannot be overstated. Pakistan's vulnerability to climate change is not a problem that can be postponed or ignored any longer. It is a crisis that demands immediate and concerted action at all levels of government, society, and the international community. Investment in climate adaptation, infrastructure resilience, and healthcare services is imperative to protect the lives and livelihoods of millions.

Sodium & Potassium Contents in Locally Baked Naans & Rottis by Flame Photometry and Its Awareness among Local Population

Muhammad Shahzad,¹ Farukh Mahmood Alvi,² Maryam Rao,³ Naila Kanwal⁴

Abstract

Background: Around the world, sodium/potassium consumption typically exceeds the levels that are normally advised. By 2025, WHO hopes to achieve a 30% reduction in the average population's salt consumption compared to 2010. Diets with a high sodium/potassium ratio of 2:1 are known to increase blood pressure and increase mortality from cardiovascular disease.

Objective: To estimate the amount of dietary sodium/potassium in Naan and Roti and assessment of baseline knowledge of general public regarding significance of presence/absence of sodium/ potassium in Naan and Roti in the tandoors of Iqbal Town, Lahore.

Method: A cross sectional study was conducted on 400 participants from 40 tandoors of Iqbal Town, Lahore by convenient sampling technique with age ranging from 18-76 years. A planned questionnaire with 14 questions was used to collect data. SPSS 23.0 Statistical software was used. Independent sample t-test was applied. p-value <0.05 was taken as statistically significant.

Results: The mean value of sodium in 100 grams of naan was 413.54 ± 22.84 mg, and in 80 grams of roti was 221.022 ± 24.96 mg. The means value of potassium in 100 grams of naan was 134.53 ± 52.51 mg and in roti it was 132.14 ± 19.73 . 21.8% of population had good knowledge of sodium/potassium and 78.3% people had poor knowledge of sodium/ potassium.

Conclusion: This study concluded that the level of dietary sodium was high while the dietary level of potassium was low in naan/roti of the tandoors. Educated people have more knowledge of sodium and potassium which is statically significant.

Key Words: Sodium, potassium, naan, roti, awareness.

Introduction

The balance of bodily fluids is significantly influenced by sodium and potassium. To sustain the body's fluid homeostasis, which requires an average salt intake of 3200 mg of sodium chloride (NaCl). Additionally, consuming too much sodium raises the chance of developing morbidity and has a direct negative impact on the target organs of the human body. Salt-sensitive blood pressure is a term used to describe blood pressure that changes with changes in sodium intake. Increased fluid retention caused by an excess of sodium in extracellular fluid raises blood volume and blood pressure.¹

Dietary salt is a vital component of bodily fluids and plays a crucial purpose in keeping blood pressure stable

even in harsh circumstances. Since a high intake of sodium causes hypertension and raises the possibility that high blood pressure is correlated with salt intake,² hypertension is directly linked to salt consumption.

Salt play an important role in maintaining the physical properties of food, PH and texture of food.³ Salt also helps in reducing the growth rate of microorganisms and pathogens leading to increasing the shelf life of food.⁴

Around the world, sodium consumption typically exceeds the levels that are normally advised, with salt being the primary culprit (NaCl). By 2025, the WHO hopes to achieve a 30% reduction in the average population's salt consumption compared to 2010. In addition, WHO advises adults to consume fewer than 2000mg of sodium and more than 3500 mg of potassium daily. Diets with a high sodium to potassium ratio of 2:1 (inadequate

1. Life Hospital, Bahria Town Lahore

2-4. Institute of Public Health Lahore

potassium and surplus sodium) are known to increase blood pressure and increase mortality from cardiovascular disease.^{5,6}

The development and progression of cardiovascular illnesses such as hypertension, ischemic heart disease, and chronic heart failure are all strongly associated with reduced dietary potassium intake. However, such diseased diseases are improved by the advised dietary potassium consumption. Thus, serum potassium level and cardiovascular health are intimately related, and disease progression is caused by a shortage in this nutrient. The mechanism causing these health issues and the development of cardiovascular problems, however, is not fully understood.⁷

The body's sodium homeostasis is crucially maintained by the renin-angiotensin system. The cardiovascular system, excretory system, and central nervous system all work together in response to this renin-angiotensin to maintain blood pressure. When an organ fails, the blood pressure drops. When the renin-angiotensin system is triggered, sodium is retained, which causes the blood volume to expand and the blood pressure to rise. High dietary salt consumption suppresses ANG-II, which results in fluid retention and a rise in blood pressure.¹⁰

Naan and roti are now often consumed by both healthy and ill people, who regard them as nutritious foods. This leads to an excessive consumption of salt and a significant risk of developing primary HTN.⁸ In 2010, it was discovered that 31.1% of people over 20 have hypertension worldwide. While middle-income and low-income nations saw increases of 7.7% and 2.6%, respectively, in the incidence of hypertension between 2000 and 2010, respectively.¹¹

The link between excessive sodium intake and potassium deficiency in the body is the most important environmental element in the process of developing primary hypertension and the accompanying cardiovascular illnesses.¹² From the ancient era to the present, our food has transformed from a high potassium/low sodium diet to a low potassium/high sodium diet.¹³ The general population consumes tandoor goods regularly, primarily in the form of Naan and roti for breakfast. The majority of people purchase these items from local tandoors that do not measure the components used to make the dough. The general public is unaware of the sodium and potassium intake.

Controlling and measuring the amount of salt that is

added to tandoor products can help healthy populations avoid acquiring chronic diseases. The strategy of sodium limitation will be crucial.

Material & Method

This cross-sectional study was conducted at Iqbal Town, District Lahore during September 2022 to December 2022. The sampling technique used was Convenient sampling technique. Sample size of Naan and Roti was 40 samples of Naan & 40 samples of roti. Sample size of general population was taken 400. Participants were be enrolled from general population visiting the tandoors. The inclusion criteria for naan/roti selection was fresh tandoor items prepared by local manufacturer. Branded products were not included.

Result

Out of 400 participants, 315 participants were male and 85 were females. 215 of them were under matric, 73 were matric, 52 were intermediate, 40 were graduated and 20 were masters. 336(84%) were claimed that they are not hypertensive and 64(16%) persons reported as hypertensive.

Among 400, 308 (77%) said that naan and roti contain sodium in it and 39(9.8%) people said that naan and roti does not contains salt in it while 13.3 % did not know the exact status. 76% of the people mentioned the correct answer that excess of sodium causes blood pressure.

40 samples were analysed and the means value of sodium in 100 grams of naan was 413.54 ± 22.84 mg, and in 80 gram of roti was 221 ± 24.95 . The means value of potassium in a 100 grams of naan was 134.53 ± 52.51 mg and in roti was 132 ± 19.73 . The maximum value of sodium in 100 grams of naan was 448 mg, minimum value of sodium in naan was 340mg and range was 108.16mg. The maximum value of sodium in 80 grams of roti was 294.40 mg, minimum value of sodium in roti was 186.24 mg and range was 108.16 mg. The maximum value of potassium in 100 grams of naan was 456 mg, minimum value of potassium in naan was 108 mg and range was 348. The maximum value of potassium in 80 grams of roti was 166.72 mg, minimum value of potassium in roti was 90.24 mg and range was 76.48.

If a single 100 grams of naan contains a 413.54 mg of sodium, and if a normal person took 3 to 6 naan in a day in all meal, then he is taking 1240.62 mg to 2481.24mg of sodium per day just from naan, while the person is

having many other sources of sodium intake during routine daily diet, so the nut shell is the amount of dietary sodium intake is extremely high as compared to the recommendations of WHO which is less than 2300mg a day. And the amount of means potassium in a naan is $134.54 \text{ mg} \pm 52.50$ and if a person took 3 to 6 naan per day than an average healthy person is taking 403.59 mg to 1326.12 mg per day which is quiet less than the recommended dose of WHO which is 5300 mg per day, so other potassium sources are required to maintain the balance. 21.8 percent of population had good knowledge of sodium and potassium and 78.3 percent people had poor knowledge of sodium and potassium.

In figure no 1, the scattered plot showing correlation of sodium in the Naan and roti as naan sodium increases roti sodium decreases.

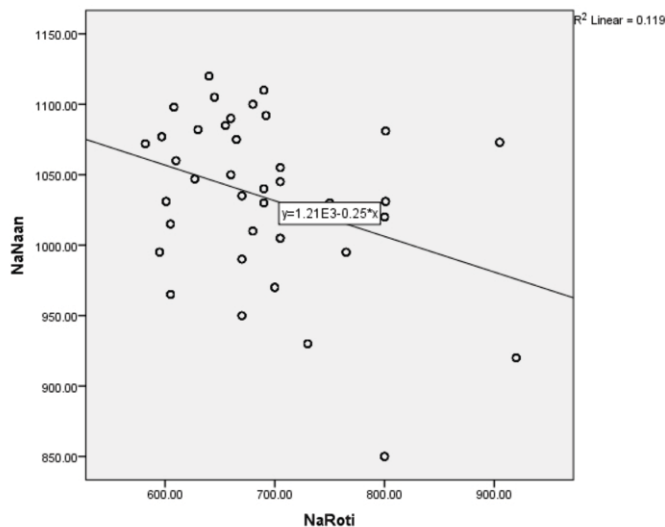


Figure1: Correlation of Sodium in Naan & Roti

Discussion

A balanced diet is one that contains important nutrients in a ratio that is necessary for growth and health maintenance and is necessary for a human being to have a healthy body. Among these nutrients, sodium and potassium play a crucial role in the development and maintenance of any person's health. Most of the naturally occurring foods contain sodium and potassium.¹ Even a small variation from this ratio might have significant consequences, including morbidity and fatality in particular cases.⁹

According to table No 1, If a single 80 grams of roti contains a 663.06 mg of sodium, and if a normal person took 3 to 6 roti a day in all meals, then he is taking 663.06 mg to 1326.12 mg of sodium per day just form tandoori roti, while the person is having many other sources of sodium intake during routine daily diet, so the nut shell is the amount of dietary sodium intake is extremely high as compared to the recommendations of WHO which is less than 2300 mg a day. And the amount of means potassium in a roti is $132.14 \text{ mg} \pm 19.73$ and if a person took 3 to 6 roti per day than an average healthy

Table 1: Sodium & Potassium in 100g naan & 80g of roti

Variable	Mean	Median	Standard Deviation	Minimum Value	Maximum Value	Range
Naan Sodium	413.54	415	22.84	340	448	108
Naan Potassium	134.53	126.80	52.51	108	456	348
Roti Sodium	221.022	217.60	24.96	186.24	294.40	108.16
Roti Potassium	132.144	135.36	19.73	90.24	166.72	76.48

Table 2: HTN and non HTN vs knowledge of sodium and potassium

	Good knowledge	Poor knowledge	Total
NON-HTN	74 22.0%	262 78.0%	336 100%
HTN	13 20.3%	51 79.7%	64 100%
TOTAL	87 21.8%	313 78.3%	400 100%

Table 3: Mean Comparison of Good knowledge & poor knowledge vs sodium potassium values

Variable	Good knowledge Mean $\pm$ SD	Poor knowledge Mean $\pm$ SD	t-Test Value	P-Value	Remarks
Age	36.98 $\pm$ 11.25	39.13 $\pm$ 12.134	-1.485	0.383	Not Significant
Sodium in Naan	409.43 $\pm$ 19.37	414 $\pm$ 23.61	-1.899	0.235	Not Significant
Potassium in Naan	124.80 $\pm$ 10.56	137.23 $\pm$ 58.83	-1.960	0.020	Significant
Sodium in Roti	227.28 $\pm$ 25.27	219.28 $\pm$ 24.62	-2.668	0.485	Not Significant
Potassium in Roti	131.47 $\pm$ 19.99	132.32 $\pm$ 19.69	-0.357	0.538	Not Significant

person is taking 396.42 mg to 792.84 mg per day which is quiet less than the recommended dose of WHO which is 3500 mg per day.^{5,6} So other sources of potassium are required to maintain the balance

According to table No 1, If a single 100 grams of naan contains a 413.54 mg of sodium, and if a normal person took 3 to 6 naan in a day in all meal, then he is taking 1240.62 mg to 2481.24mg of sodium per day just form naan, while the person is having many other sources of sodium intake during routine daily diet as he is using naan with some salan which is also rich in salt. So the nut shell is the amount of dietary sodium intake is extremely high as compared to the recommendations of WHO which is less than 2300 mg a day. And the amount of means potassium in a naan is $134.54 \text{ mg} \pm 52.50$ and if a person took 3 to 6 naan per day than an average healthy person is taking 403.59 mg to 1326.12 mg per day which is quiet less than the recommended dose of WHO which is 3500 mg per day, so other potassium sources are required to maintain the balance. As excess dietary sodium intake and decreased potassium intake is directly concerned with the production of prehypertension and hypertension along with other diseases, WHO set a global target of cutting down dietary salt intake by up to 30% by year 2025.

Like the other countries of the all the continents use of naan and roti items is increasing day by day in sub-continent and especially in Pakistan. In Pakistani population the use of locally made naan and roti and other products like cereal products has become an essential element of their diet. These tandoor items are used at large scale with liberty in daily routine of urban and rural population. Home kitchen is gradually being replaced by these tandoor food items. There is no study available that how much sodium/ salt is used in making and baking these local items.

Keeping the warning of the WHO regarding imbalance in ratio for the use of dietary sodium and dietary potassium in diet, this study was designed for the local population of Lahore, Punjab, Pakistan. The other reasons for performing this study are: no study exists or available which may guide the public health experts to develop SOPs regarding the drastic results of injudicious use of dietary sodium and dietary potassium in tandoor items. This will help the local population not only to prevent the initiation and development of chronic non-communicable diseases but also prevention of their complications along with risk reduction of morbidity and mortality.

Another objective of this study was to check and assess the awareness in healthy and diseased public. Checking the baseline knowledge of the general public using tandoor food items. 21.8 percent of population have good knowledge of sodium and potassium and 78.3 percent people have poor knowledge of sodium and potassium. 8 females out of 85 (9.4%) females have good knowledge of sodium and potassium and 79 males out of 315 males have good knowledge of sodium and potassium which is 25.1 percent, so males have more good knowledge of sodium and potassium as compared to females. (p value 0.002). it means this difference is not by chance, so its means males have more knowledge of sodium and potassium.

The knowledge and awareness of general population both educated and uneducated is not up to mark. Educated people have better knowledge which is statically significant. p value is 20.001. It means this difference is not by chance. Educated people have more knowledge about salt.

Table no 2 shows 22 percent of non- HTN people have good knowledge and 20.3 percent of HTN people have good knowledge of sodium and potassium. This shows that those who did not have HTN have good knowledge of sodium and potassium and those who have HTN have poor knowledge of sodium and potassium. However this difference is not statistically significant. (p value=0.761).

In table no 3 the post statistical analysis performed with the independent t-test to check the significance level between good knowledge and poor knowledge and the amount of sodium and potassium achieved after analysis was not significant as (p value= 0.485.) People with good knowledge are using more sodium in the rotti as compared to people with poor knowledge. It means people having good knowledge of salt are failed to influence local tandoors to cut down the salt content of rotti.

In figure no 01, the scattered plot showing correlation of sodium in the Naan and rotti. There is a weak negative co relation between sodium of naan and roti as sodium content of naan increases, sodium content of roti decreases. This is likely due to the fact that at tandoors roti is more is demand item than naan so more raw material is made for roti and because of their malpractice equal quantity of salt by fist method is added in both raw materials of naan and roti.

Conclusion

People were unaware of the main dietary sources of salt and salt intake is underestimated. The result of this study demonstrated that tandoori naan and roti contain significantly more dietary sodium and less dietary potassium in contrast to WHO guidelines being recommended for daily usage. Furthermore, the tandoori items dominate in contributing the increased use of dietary sodium intake per day and decreased potassium intake per day.

It can be concluded from the study that, regarding baseline knowledge/awareness of the general public regarding judicious or in judicious use of these dietary nutrients. Educated population had a better knowledge. Even people having good knowledge of sodium and potassium are taking high amount of sodium.

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Frequency of Brucellosis among the Abbatoir Workers Working in Slaughter Houses of Lahore

M. Hammad Mushtaq,¹ Saima Ayub,² Zarfishan Tahir,³ Rabia Islam,⁴ Ayub Ali⁵

Abstract

Background: The disease Brucellosis transmitted from animal to human is a major challenge the world is facing now a days. A large number of known infections and new emerging infections in human are known to be zoonotic. Brucellosis is among the top 10 zoonotic infection having devastating impact on economy. This disease is also prevalent in Pakistan. Because of lack of many surveillance strategies and less number of studies, a study on high risk or exposed population can help understand the issue allows better public health policies to be directed towards its prevention and elimination.

Objective: To find out the frequency and risk factors of human brucellosis among abattoir workers.

Methodology: A cross sectional study with purposive sampling carried out in slaughter house of Lahore. 263 of abattoir workers participated in the study. Data was collected by two ways, a blood sample for screening of human Brucellosis and a questionnaire to assess risk factors for the disease. Data was analyzed using SPSSv.20. Frequency and percentage was used to summarize the data while Chi square test applied to find association between disease and risk factors.

Results: A total of 263 individual participated out of which 6 were found positive while the rest were negative. 260 individuals had no knowledge regarding zoonotic disease. All of the individuals followed the preventive strategies.

Conclusion: The current study determine the frequency of brucellosis among the abattoir workers working in slaughter house of Lahore Shahpurkanjran. The study revealed frequency of (2.3%) among the abattoirs worker.

Key Words: Brucellosis, Zoonotic Disease, Personal Protective equipment

Introduction

Brucellosis is a public health problem in Pakistan as it remains a major infection. It is prevailing in western parts of Asia, India, Middle Eastern, Southern European, and Latin American countries. Human brucellosis is found to have major existence in rural/ nomadic populations where people live in close association with animals. Worldwide, occurrence of human brucellosis in endemic disease areas varies approximately 200 per 100,000 population.¹ Brucellosis is a common anthroozoonotic infection around the world.² Incidence of brucellosis is increasing in several regions like Asia, Sub-Saharan Africa, Latin America, the Middle East and South Eastern Europe.³

Annually more than 500,000 cases of brucellosis are reported, despite an understanding of its mode of transmission the disease remains a global problem, more so in developing countries.⁴ Brucellosis spread through direct contact with infected animal, through infected food as well as placenta of aborted animals.⁵

The brucella transmission directly or indirectly also affect human. Human brucellosis is transmitted mainly from infected pets or from ingestion of infected food and main species responsible are *B.melitensis* and *B. abortus*.⁶

The main species of brucella are *B. mellitensis*, *B.abortus*, *B.microti* and *B.canis* The symptoms in human are mainly fever, respiratory, neurological are not very common so diagnosis is on blood cultures mainly. The treatment consist of antibiotics combination but mainly

1. DMS Jinnah Hospital, Lahore

2-5. Institute of Public Health, Lahore

tetracycline. The control is prevention by avoiding occupational contact and food contamination.^{6,7} Brucellosis leads to still birth, abortion and decreased fertility and is considered as the commonest zoonotic disease.⁸ Human brucellosis is transmitted mainly from infected pets or from ingestion of infected food and main species responsible are *B. melitensis* and *B. abortus*. It spreads to humans via direct contact with infested tissues (especially genital organs and birth products), inhalation of aerosols, and ingestion of raw milk and dairy products from infected animals.⁶

In a study by Aqad et al, *Brucella* cases were mainly due to *B. melitensis*. As per studies this disease has a high sero-prevalence among the slaughterhouse workers in Pakistan.⁹ It presents with nonspecific symptoms such as fever, night sweats, anorexia, myalgia, weight loss, and arthralgia. Several commercial serological tests are available for humans and animals.¹⁰ Shafee et al. (2011) established that by using MRT i-ELISA the overall prevalence of Brucellosis in Quetta to be 3% in cattle and 8.5% in buffaloes.¹¹

Maoumi et al conducted a study in slaughter house in 1992 in Pakistan and concluded that the seroprevalence rate of brucellosis was 8.33%. Similarly a few studies in Iran stated that brucellosis, leptospirosis and Q fever are important risk factors for slaughter house workers.¹²

To determine the prevalence of Brucellosis in government and private sector livestock farms of Pakistan, numerous studies have been done using sero-diagnostic techniques. A study was conducted in the Potohar Plateau, Pakistan with the objective to isolate brucellae from seropositive milk samples, aborted fetuses, and vaginal swabs of buffaloes were collected. A total of 262 serum samples were collected from people of different occupations: veterinary workforces, milkmen, slaughterhouse workers and livestock farmers. Sero prevalence was found by Rose Bengal Test and Serum agglutination tests. Isolation of brucellae was done on modified Farrell's serum dextrose agar. Altogether they were identified as *B. abortus* biovar 1 based on conventional biotyping techniques species-specific PCR. This study provided the first report on the prevalence of *B. abortus* biovar 1 in cattle and buffaloes in Pakistan.¹³

Material & Methods

A questionnaire based cross sectional study was conducted by interviewing the workers who follow the inclusion criteria. After consent and aseptic measures blood samples were collected in 3ml amount of venous type by

phlebotomist. Blood specimens were labeled with the code on vial and that code was also be pasted on the questionnaire. Samples were conveyed and analyzed by Rose Bengal Plate Agglutination test *Brucella abortus* and *Brucella melitensis* antibodies in bacteriology laboratory of institute Of Public Health Lahore.

Data in SPSS version 20.0 was entered and analyzed. Frequency tables for all variable made. Mean central tendency was calculated chi squared was applied to see association between different variables comparison of mean by applying t-test or ANOVA where needed. For continuous data Bar and pie diagrams, scatter plot and box plot were used.

Results

Seropositivity of brucellosis was tested among 263 abattoir workers by Rose Bengal Platelet agglutination test, 6 were found to be positive while 257 were negative. On applying Chi square to see the association between different variables the results were not significant.

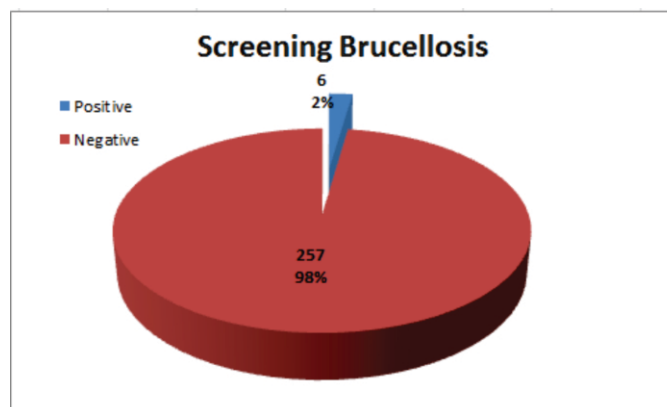


Figure 1: Graphical representation of screening results of abattoirs workers

Discussion

A number of the population in Pakistan is linked with slaughtering, slaughter houses and related job, as they are exposed to animals throughout their career these workers are real candidate to develop zoonotic diseases specially brucellosis. The main objective of the study was to estimate the incidence of brucellosis among abattoir workers working in slaughter house of Lahore. The risk factors were also considered, their study and assessment in daily routine practices of workers is keenly observed and assessed.¹⁴

This study depict that the frequency of brucellosis is (2.3%) among the abattoir workers working in slaughter house, all were male. Another study in Pakistan deter-

Table 1: Frequency of Abattoir workers regarding nature of job and its type

Variable		Frequency	Percentage
Nature of job	Beef butcher	31	11.8
	Beef helper	26	9.9
	cleaner	7	2.7
	hawker	15	5.7
	loader	14	5.3
	Meat seller	6	2.3
	Mutton butcher	47	17.9
	Mutton butcher manual	42	16.0
	Mutton helper	73	27.8
	Veterinary doctor	2	0.8
Job type	Beef related	57	21.7
	Mutton related	162	61.6
	others	44	16.7

Table 2: Association between symptoms and screening

		screening			P value	re-marks
		negative	positive	total		
h/o intermittent fever screening results	no	256	6	262	1.000	Non-significant
		97.7%	2.3%	100.0%		
	yes	1	0	1		
		100.0%	0.0%	100.0%		
	total	257	6	263		
h/o joint pain screening result	no	256	6	262	1.000	Non-significant
		97.7%	2.3%	100.0%		
	yes	1	0	1		
		100.0%	0.0%	100.0%		
	total	257	6	263		
		97.7%	2.3%	100.0%		

mined incidence of brucellosis among individuals to be 24%.⁵ This high percentage as compared to this study is might be due to unprotected environment and lack of preventive strategies. Abbatoir workers working in slaughter house should be well equipped and routine medical checkups are also present for abbatoir workers. Another study conducted in Ethiopia showed 4.7% frequency of brucellosis and protective strategies used by workers was only 19% hence this study concluded that there is significant association between lack of protective precautionary measures and lack of awareness regarding brucellosis.¹⁵ The present study deeply elaborated the risk factors like hand wash before and after

Table 3: Association between preventive strategies practiced and screening

		screening			P value	re-marks
		negative	positive	total		
PPE gloves screening results	no	22	0	22	1.000	Non-significant
		100.0%	0.0%	100.0%		
	yes	235	6	241		
		97.5%	2.5%	100.0%		
	total	257	6	263		
PPE mask screening results		97.7%	2.3%	100.0%	1.000	Non-significant
	mask	234	6	240		
		97.5%	2.5%	100.0%		
	no	23	0	23		
		100%	0.0%	100.0%		
aprons screening results	total	257	6	263	1.000	Non-significant
		97.7%	2.3%	100.0%		
	no	146	3	149		
		98.0%	2.0%	100.0%		
	yes	111	3	114		
		97.4%	2.6%	100.0%		

slaughtering, use of aprons, long boots, mask, gloves all the protective strategies during the study has been seen and been properly implemented by the slaughter house authority on the individuals working in slaughter house. The individuals with hand wash before and after were (100%).PPE gloves used by individuals are (91.6%) and not used are (8.4%) and mask usage percentage is (91.3%). Aprons used by individuals are (43%). This high percentage of protective equipment strategies lead to less frequency of brucellosis as compared to study in Ethiopia.

A study was conducted in 2018 in Qatar where incidence of brucellosis was studied and evaluated by notification and central surveillance system from January to November 2018 in which 125 new cases of brucellosis were reported. 32.8% of the cases have been reported by laboratory system and 63.2% were by physicians through central surveillance system.¹⁶ However in the current study there is no surveillance and notifiable system to assess the actual frequency of brucellosis in general population. Pakistan is developing country and is much far behind regarding control of zoonotic diseases. There is no centralized monitoring, surveillance and evaluation system.

In the absence of these systems, small studies can help in highlighting the incidence of brucellosis. The studies on abattoir workers working in slaughter houses and aside from slaughter houses need to be addressed and highlighted. Inter-sectoral coordination between health authorities and livestock department along with centralized surveillance system would aid to estimate the unknown incidence occurring among abattoir workers. The need of hour is to educate the workers and strict policies regarding implementation of protective and preventive strategies along with routine medical examinations. There must be seminars and routine visits by the livestock authorities in general population because as this slaughter house is following the standard protocols and measures but this is not in case for the whole or general population. Health authorities should make it compulsory for the abattoir workers routine medical test yearly and there must be a concept of central lab at least at district level.

Conclusion

The current study determine the frequency of brucellosis among the Abattoir workers working in slaughter house of Lahore Shahpurkanjran. The study revealed that frequency of (2.3%) among the abattoir workers. This percentage is very low as compared to other studies conducted in other various region of Pakistan. The low frequency rate is definitely due to strict policies of preventive and the protective strategies used by the workers as gloves ratios and use of mask is near (100%). And routine medical examination is also mandatory for workers. However the knowledge of this disease and other zoonotic disease are very poor among the abattoir workers but this factor contributes no significance in this study.

Result of this study can be taken as a role model and protective strategies used can be implemented along with improvement in some factors like health education regarding disease for workers and central laboratories for the workers where routine medical examination for zoonotic disease can be done by the use of sophisticated techniques like ELISA.

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Perception towards Telepsychiatry; A Cross Sectional Survey of Psychiatry Doctors in Lahore

Muhammad Ali Awab Sarwar,¹ Wardah Shams,² Muhammad Sajid Mustafa,³ Erum Sarwar,⁴ Rabbiya Ashraf⁵

Abstract

Background: The use of telepsychiatry involves utilizing technology to deliver a variety of services, such as psychotherapy, patient education, and medication management. Limiting access to recognized psychiatric services caused a rise in the demand for mental health care.

Objectives: The objective of this study was to determine the convenience, feasibility, clinical effectiveness, safety, and willingness of psychiatrists in Lahore to use telemedicine and to adopt it.

Material and Methodology: In this cross-sectional survey, an online self-developed questionnaire was sent to 100 psychiatrists working on different posts in Lahore from October 2021 to December 2021, from which 62 clinicians responded, leading to a response rate of 62%. The data was entered and analyzed by chi-square and t-test by using SPSS version 24.

Results: The majority of participants belong to a younger age group (25-40), and female psychiatrists comprise a greater number (56.7%). There were 38.7% of the participants found using telepsychiatry in routine patient care convenient, 56.5% found it technically friendly, 41.9% had concerns regarding safety, and 58.1% showed willingness. Both private and hospital settings found telepsychiatry convenient (38.7%), technically friendly (56.5%), clinically effective (54.8%), and showed willingness to use it in the future (58.1%). Most of them found completely virtual consultation more convenient than a remote clinic requiring the presence of coordinator.

Conclusion: Our study on psychiatrists for telepsychiatry found completely virtual consultation more convenient, effective, and feasible to use in routine patient care. There are still some challenges and barriers to overcome for its effectiveness in the future.

Introduction

Telepsychiatry is the application of telemedicine to the field of psychiatry, and involves providing a range of services including psychiatric evaluations, psychotherapy, patient education and medication management via use of technology. There is a general consensus on the cost-effectiveness and convenient access to mental health care that telepsychiatry offers. Telepsychiatry also termed as tele mental health or E-mental health, is broadly defined as the use of Information and Communication Technology to provide or support psychiatric services across distances.¹ Telemedicine is the use of electronic information and communications technolo-

gies to provide and support health care when distance separates the participants.²

Tele-mental health refers to the provision of mental health services, such as diagnosis, assessment, symptom tracking, and therapy, remotely through the use of computer programs, Internet programs, teleconferencing, and smartphone applications.³

The advent of the COVID-19 pandemic and its psychological, social and economic consequences such as lockdowns led to a surge in mental health care needs, while simultaneously limiting the availability of formal psychiatric services. Telemedicine, particularly video consultations across various medical specialties, was scaled up to reduce the risk of spread of COVID-19, especially in the United Kingdom and the United States of America. For instance, general telemedicine visits increased by 683% between March 2nd and April 4th

1. Services Hospital, Lahore

2,3. Institute of Public Health Lahore

4. Children Hospital Lahore

5. Psychologist, Lahore

2020 at a healthcare system in New York, America, in response to COVID-19.⁴

In Pakistan, a few projects such as the Agha Khan Developmental network eHealth program,⁵ as well as independent practitioners have adopted telepsychiatry over the last few years; however, such telepsychiatry programs are informal, and no national policy or legal framework exists to regulate its implementation or limitations.⁶ The current Pakistan Medical and Dental Council (PMDC) code of ethics dates back to the pre-digital era, offering little guidance on the practice of telemedicine.⁷ Furthermore, data on the transition towards telemedicine in Pakistan is scarce. Numerous barriers exist in the effective healthcare delivery for service users such as limited access to the required technology and lack of digital literacy to name a few.⁸ The experience of service providers, their concerns and willingness to adopt telepsychiatry needs to be explored in order to determine its feasibility in the years to come.⁹

Limited access to recognized psychiatric services caused a rise in the demand for mental health care. There was a need to conduct a study that would determine the convenience, feasibility, clinical effectiveness, safety, and willingness of psychiatrists in Lahore to use telemedicine and to adopt it. This helped us in the use of telepsychiatry, which involves utilizing technology to deliver a variety of services, such as psychotherapy, patient education, and medication management.

Operational Definitions

Clinical trials and other forms of evaluation of medical treatment are held to give an objective assessment of the 'clinical effectiveness' of the medical treatments under evaluation.¹⁰

Patient safety is defined as the absence of preventable harm to a patient and reduction of risk of unnecessary harm associated with health care to an acceptable minimum.¹¹

Objectives

- The objective of this study was to determine the convenience, clinical effectiveness and safety as perceived by psychiatrists in Lahore and their willingness to adopt it.

Material And Methods

Cross-sectional research design was used for this study.

Through purposive sampling, 100 participants were intentionally selected based on their relevance to the study's objectives. Ethical permission was taken from ethical review board and informed consent was obtained from the participants. Data was collected after approval from the ethical committee of hospital. Self-designed questionnaire covering the 4 areas of the convenience, clinical effectiveness, safety as perceived and their willingness to adopt it was designed and sent to medical officers, post graduate trainees, specialists in purely clinical posts and specialists in teaching hospitals working in psychiatry across Lahore. Data was collected through an online survey designed by researcher.

Methodology

The study included medical professionals working as consultant Psychiatrists and junior doctors. The study questionnaire was designed and modified based on previously published research articles and pre-tested by experts having experience in the field of telemedicine. The questions ratings were measured by a three-point Likert scale, 1= Disagree; 2= neutral and 3= Agree. For comparison of categorical data, chi square test was used, and statistically significant differences were considered at $p < 0.05$. The data was entered and analyzed using (SPSS) version 24. For quantitative variables such as age (in years) was presented as mean $\pm$ standard deviation (S.D).

Results

Demographic characteristic of participating physicians $n = 62$.

Demographic characteristics provides insights into the participating physicians' experiences with telepsychiatry. The majority of participants (75.8%) belong to the age group of 25-40 representing a younger sample of psychiatrists. The gender distribution comprises a greater number of female psychiatrists (56.7%) in contrast to males (43.5%). The study survey included a variety of psychiatrists in different ranks, with specialists in non-teaching posts (53.2%) being the largest group as compared to specialists in teaching posts (16.1%), which was the smallest group in the sample. The majority of the participants (66.1%) in the conducted survey opted for telepsychiatry at the onset of COVID-19, suggesting the pandemic played an important role in the adaptation of telemedicine. A substantial portion of psychiatrists used telemedicine in private practice (41.9%), and considerable numbers of participants used telepsychiatry

in both private and hospital settings. It is worth noting that a large majority of psychiatrists (79.9%) engaged in completely virtual consultations. The data reveals that only 25.8% of respondents obtained structured feedback from patients after every online consultation.

Convenience, effectiveness and safety of utilizing telepsychiatry as perceived by the participants, and their willingness towards it

The study showed that 38.7% of the participants agreed with telepsychiatry being a convenient approach. More than half of the professionals (56.5%) found telepsychiatry technically friendly, largely those who were specialists in non-teaching, clinical posts (81.8%).

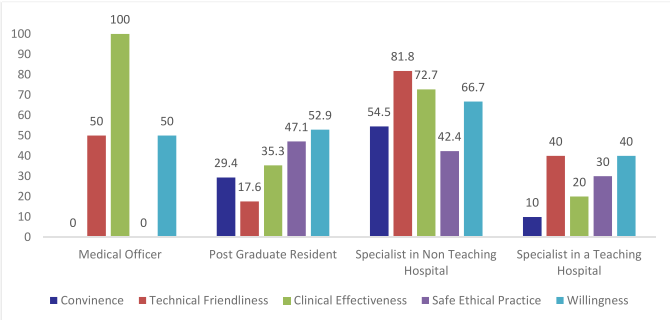


Fig 1: Factors Related to Perceived Convenience, Effectiveness, Safety and Willingness Toward Telepsychiatry by Professionals in Percentages

Factors related to the setting in which telepsychiatry was utilized and perceived convenience, effectiveness, safety and willingness toward telepsychiatry in percentages, p(0.01) values to indicate significance difference.

The study shows that a significant proportion of professionals in both private and hospital settings found telepsychiatry technically friendly (56.5%) and clinically effective (54.8%). However, most of them (41.9%) expressed concerns about patient safety and ethical practice in all settings, but more so in the private setting (53.8%).

Factors related to mode of telepsychiatry practice and perceived convenience, effectiveness, safety and willingness in percentages, p (0.01) values to indicate significance difference.

Study shows outlines the different modes adapted in telepsychiatry practice, namely completely virtual consultation (CVC) and remote clinic. Interestingly CVC was considered more convenient (40.8%) than Remote clinic requiring presence of a designated coordinator

Table 1: Factors related to the setting in telepsychiatry was utilized

	Level	n=62	Hospital setting	Private setting
Convenience	Disagree	32.3%	50.0%	42.3%
	Neutral	29.0%	37.5%	19.2%
	Agree	38.7%	12.5%	38.5%
	Total	100.0%	100.0%	100.0%
Technical friendliness	Disagree	38.7%	50.0%	46.2%
	Neutral	4.8%	12.5%	00
	Agree	56.5%	37.5%	53.8%
	Total	100.0%	100.0%	100.0%
Clinical effectiveness	Disagree	41.9%	68.8%	38.5%
	Neutral	3.2%	00	00
	Agree	54.8%	31.3%	61.5%
	Total	100.0%	100.0%	100.0%
Safe ethical practice	Disagree	41.9%	50.0%	34.6%
	Neutral	17.7%	31.3%	11.5%
	Agree	40.3%	18.8%	53.8%
	Total	100.0%	100.0%	100.0%
Willingness	Disagree	37.1%	43.8%	38.5%
	Neutral	4.8%	6.3%	00
	Agree	58.1%	50.0%	61.5%
	Total	100.0%	100.0%	100.0%

at the site of the patient. However, most of them (41.9%) showed concerns about its Safe ethical practice in both modes especially in CVC (42.9%).

Discussion

The aim of this research was to evaluate the perceived convenience, effectiveness, safety, and willingness towards telepsychiatry by psychiatrists during COVID-19. We conducted semi-structured interviews with 62 psychiatrists from different posts about their convenience, effectiveness, and willingness to utilize telepsychiatry.

The research involved a survey group: one with use of telepsychiatry at different settings and another with different modes of telepsychiatry with a psychiatrist. The results showed that most professionals found telepsychiatry convenient, friendly, effective, and willing in both settings, and most psychiatrists adapted to completely virtual consultation (CVC) and found it convenient. The main benefits of telepsychiatry were increased access to mental health care, reduced travel costs and time, and improved continuity of care.

Table 2: Factors related to mode of Telepsychiatry practice

Mode of Practice Involve in Telepsychiatry					Chi Square Value
	Level	Remote Clinic Requiring Presence of a Designated Coordinator at the Site of the Patient	Completely Virtual Consultation with No Assistant or Coordinator	Total	
Convenience	Disagree	30.8%	32.7%	32.3%	0.67
	Neutral	38.5%	26.5%	29.0%	
	Agree	30.8%	40.8%	38.7%	
	Total	100.0%	100.0%	100.0%	
Technical friendliness	Disagree	15.4%	44.9%	38.7%	0.03 ¹
	Neutral	15.4%	2.0%	4.8%	
	Agree	69.2%	53.1%	56.5%	
	Total	100.0%	100.0%	100.0%	
Clinical effectiveness	Disagree	15.4%	49.0%	41.9%	0.07
	Neutral	7.7%	2.0%	3.2%	
	Agree	76.9%	49.0%	54.8%	
	Total	100.0%	100.0%	100.0%	
Safe ethical practice	Disagree	46.2%	40.8%	41.9%	0.70
	Neutral	23.1%	16.3%	17.7%	
	Agree	30.8%	42.9%	40.3%	
	Total	100.0%	100.0%	100.0%	
Willingness	Disagree	15.4%	42.9%	37.1%	0.04*
	Neutral	15.4%	2.0%	4.8%	
	Agree	69.2%	55.1%	58.1%	
	Total	100.0%	100.0%	100.0%	

* p value less than 0.05 is statistically significant

This survey examined the use and perception of telepsychiatry among psychiatrists in Lahore. The outcome of this study provides insights into the use of telepsychiatry in a remote clinic setting that requires the presence of a designated coordinator or assistant to be more technical friendly, and health care providers showed a greater willingness to use telepsychiatry. Clinical effectiveness showed significant importance in private settings.

A Lebanese survey of 140 physicians during the COVID-19 pandemic revealed that physicians engaged and showed greater willingness toward adopting telemedicine.⁵ This was accompanied by a shift in perceptions about the use of IT in medicine during COVID-19 and an increase in telemedicine activities. According to

research conducted in Lahore among psychiatrists, health care providers are concerned about the use of technology as a safe ethical practice. Previous studies showed that some health care providers worry that telemedicine could undermine their professional autonomy and add to their workload.^{12,13} A study showed that technical friendliness and convenience are major factors in remote clinics requiring the presence of a designated coordinator as compared to CVC with no assistance. The success of telepsychiatry hinges significantly on a robust and efficient technological framework. Advancements in technology are diminishing technical hurdles in telepsychiatry, suggesting that with better technologies, interventions in telepsychiatry could significantly enhance current practices.¹⁴

A study, encompassing 819 mental health care providers in the US, revealed a predominantly positive view of telepsychiatry amid the pandemic. Participants praised its flexibility and reduced no-shows but flagged challenges like device usability and connectivity issues. Encouragingly, 64% expressed interest in continuing telepsychiatry post-pandemic.⁽¹⁵⁾ However, concerns around limited technology access and inadequate training surfaced, signaling a need for support.⁽¹⁵⁾

Telepsychiatry's primary growth area is expected to focus on refining professional guidelines, competencies, and quality standards. Practitioners are urged to collaborate, sharing effective approaches, establishing standardized safety measures, and engaging with professional bodies to redefine contemporary benchmarks for clinical excellence.^{16,17}

The study's limitations include a small sample size, potentially limiting the generalizability of the findings. Additionally, the survey didn't differentiate between the use of telemedicine due to pandemic restrictions or personal choice, impacting the context of adoption. Relying on self-reported data in the questionnaire might introduce recall bias, influencing the accuracy of responses.¹⁷

Conclusion

This study highlights the affirmative impact of telepsychiatry on convenience, effectiveness, and willingness among psychiatrists, indicating its feasibility and acceptance, particularly with completely virtual consultations. However, challenges such as technical issues and privacy concerns have emerged, prompting the need for improved training, support, and evaluation strategies. This study

resonates with the global shift towards telemedicine during the pandemic but draws attention to the necessity of addressing concerns for the responsible and effective implementation of telepsychiatry.

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Assessment of the Residual Effect of Temephos on *Aedes Aegypti* (Diptera, Culicidae) Larvae in Artificial Containers

Muhammad Uzair Mukhtar,¹ Muhammad Asif Mahmood,² Shoaib Rafique³

Abstract

Background: Temephos, a widely employed larvicide, plays a pivotal role in controlling *Aedes aegypti*, the primary vector responsible for transmitting arboviruses like dengue, Zika, and chikungunya.

Objective: This study investigated the residual effect of temephos in artificial containers, crucial for optimizing mosquito control strategies.

Methodology: The application of temephos was carried out at the campus of the Institute of Public Health (IPH) Lahore in three ordinary household containers: plastic buckets, tin cans, and tires. The containers were divided into treatment and control groups to assess temephos' impact on *Aedes aegypti* larvae over time.

Results: The mortality in the all three containers remained 100% after 24 hours of exposure but dropped below cut off mortality percentage i.e., 80% for maximum 45 days in plastic bucket, followed by tin can (66%) and tire (37%).

Conclusion: This study's outcomes have important implications for mosquito control programs, guiding the development of evidence-based reapplication strategies to ensure sustained larval control. Furthermore, it underscores the importance of ongoing surveillance to detect potential resistance in *Aedes aegypti* populations.

Keywords: *Aedes aegypti*, Dengue, Temephos, Lahore

Introduction

The relentless global burden of mosquito-borne diseases, particularly those transmitted by *Aedes aegypti* mosquitoes, has catalyzed ongoing efforts to develop and implement effective vector control strategies.¹ *Aedes aegypti*, the primary vector responsible for transmitting debilitating diseases such as dengue fever, Zika virus, and chikungunya, continues to pose a significant public health threat in tropical and subtropical regions across the globe.² In Pakistan, the relentless resurgence of dengue outbreaks has spurred extensive efforts to control the *Aedes* mosquito population.³ Among the myriad strategies employed, chemical larvicides, like temephos, have played a pivotal role in larval control programs.⁴

Temephos, an organophosphorus insecticide, has long been used to target *Aedes* mosquito larvae in artificial containers, where they frequently breed.⁵ Its effectiveness in reducing mosquito populations and subsequently curtailing disease transmission is well-documented.⁴

However, the sustainability of temephos-based interventions hinges on several factors, including the persistence of the larvicide's residual effect and the emergence of resistant mosquito populations.⁶

While temephos has been instrumental in controlling *Aedes aegypti* larvae, it is imperative to assess the residual effect of this larvicide under local conditions⁽⁷⁾. Understanding the longevity of temephos' efficacy for optimizing larval control strategies and mitigating the risk of insecticide resistance.⁸ This research article aims to provide a comprehensive assessment of the residual effect of temephos on *Aedes aegypti* larvae inhabiting artificial containers. By investigating the duration of larvicide efficacy, its impact on larval development, and the potential emergence of resistance, this study seeks to inform evidence-based vector control strategies tailored to the unique challenges posed by the local environment. In doing so, we aspire to contribute to the sustainable management of *Aedes* mosquito populations and the reduction of dengue transmission risk in the area, thus offering valuable insights with broader implications for mosquito-borne disease control

1,2. Institute of Public Health, Lahore

3. Department of Entomology, University of Faisalabad

efforts worldwide. To investigate the sustained impact of temephos on *Ae. aegypti* larvae within artificial containers, this study was conducted at the campus of the Institute of Public Health (IPH) in Lahore, Pakistan.

Material and Methods

Temephos was used in the 1% a.i. (active ingredient) formulation at a 1 ppm (one part per million) concentration to evaluate its effectiveness in controlling immature forms of *Ae. aegypti*. This dose is harmless to humans but lethal to mosquito vectors. Test was conducted at the campus of the Institute of Public Health (IPH) Lahore. Three ordinary household containers were used for the experiment: plastic buckets, tin cans, and tires. Three containers of each kind were used, containing water mixed with the larvicide. On the day the test was set up, and every two weeks thereafter up to 45 days, 25 third-instar larvae from the IPH’s insectary were placed directly in the container water for exposure. Mortality readings were conducted after 24h. Larvae were recaptured with the aid of a larvae net. One control was kept for each kind of container, which also received 25 larvae.⁹

Results

Results of temperature, pH, and conductivity measurements were recorded at the beginning (September 5, 2022) and end (November 20, 2022) of the experiment at the IPH campus. The average difference between the initial and final temperature was only 3°C. The pH fluctuated between 4.50 and 5.00, not presenting great modifications following the addition of temephos. Variation remained between 4.50 and 6.90, with the highest pH values recorded in tires in which temephos was applied (6.50 and 6.90). The control tire had a pH of 5.00.

Table 1 shows total mortality in each replicate, the number of larvae per container, and reading periods.

Mortality percentiles observed in all three types of containers are shown graphically in Figure 1. The mortality in the all three containers remained near 100% after 24 hours of exposure but dropped below cut off mortality percentage i.e., 80% for maximum 45 days in plastic bucket, followed by tin can (66%) and tire (37%).

Table 1: Mortality observed in three kinds of containers treated with temephos (Abate).

Containers	Repli-cates	No. of larvae tested	Readings			
			24 hr	15 days	30 days	45 days
Plastic bucket (15 liters)	A1	25	25	24	24	20
	A2	25	25	25	22	21
	A3	25	25	24	23	19
	Total	75	75	73	69	60
			(100%)	(97%)	(92%)	(80%)
Tin Can	Control	25	0	0/1	0/2	0/2
	B1	25	25	21	18	17
	B2	25	25	22	17	18
	B3	25	25	21	19	15
	Total	75	75	75	54	50
Tire (5 liters)			(100%)	(85%)	(72%)	(66%)
	Control	25	1	0/2	0/2	0/2
	C1	25	25	15	10	10
	C2	25	25	13	12	10
	C3	25	25	14	8	8
	Total	75	75	42	30	28
			(100%)	(56%)	(40%)	(37%)
	Control	25	0	0/1	0/1	0/2

0/0 The second number (to the right of the slash) refers to pupae.

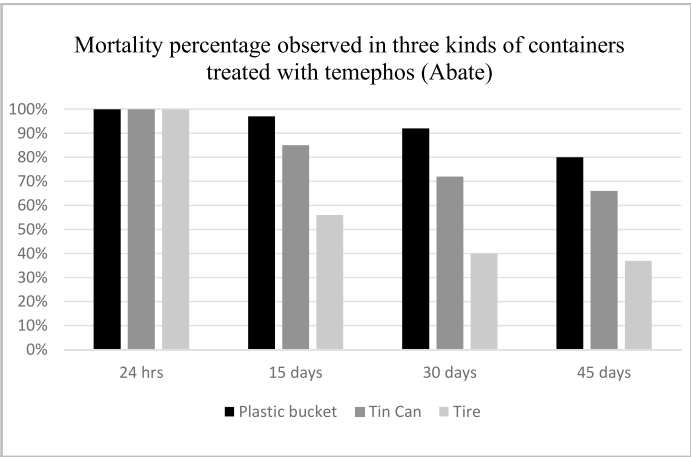


Figure 1: Mortality percentage observed in three kinds of containers treated with temephos (Abate)

Discussion

The assessment of the residual effect of temephos on *Aedes aegypti* larvae in artificial containers provides critical insights into the sustained efficacy of this larvicide within a specific urban environment. Our study demonstrates that temephos remains effective in con-

trolling *Aedes aegypti* larvae in artificial containers for an extended period, with significant larval mortality observed till 45 days. These results align with the findings of several previous investigations conducted in various geographical locations. For instance, a study by Prophiro et al. (2019) in Brazil reported similar sustained efficacy of temephos over a 30-day period.¹⁰ This consistency in results across different regions underscores the robustness of temephos as a long-lasting larvicide, making it a valuable tool in mosquito vector control programs.

This research highlights the importance of considering container type in the effectiveness of temephos-based interventions. Plastic buckets and tin cans consistently exhibited high larval mortality rates, while discarded tires showed slightly reduced efficacy over time. This finding is consistent with the observations made by Camargo et al. (1998) in a study conducted in Eliana⁽¹¹⁾. The variability in container susceptibility emphasizes the need for tailored vector control strategies, taking into account the local context and container diversity. In areas where discarded tires are prevalent breeding sites, supplementary control measures may be required to ensure effective *Aedes* mosquito management.

Present study contributes to the growing knowledge on larvicide-based vector control strategies for *Aedes aegypti*. It reaffirms the importance of sustained larvicidal efficacy in reducing mosquito populations and, subsequently, the transmission of diseases like dengue. However, it is essential to acknowledge that the emergence of insecticide resistance is an ongoing concern. While our study did not investigate resistance development, it underscores the necessity for continuous monitoring and research in this area.

Conclusion

In conclusion, our investigation into the residual effect of temephos on *Aedes aegypti* larvae in artificial containers underscores the continued efficacy of this larvicide as a vital component of vector control strategies. The sustained larvicidal activity observed up to a 45-day period. However, the differential effectiveness across container types emphasizes the need for context-specific interventions, considering the container diversity in urban environments. These findings not only inform local vector control programs but also contribute to the broader understanding of larvicidal strategies for combatting mosquito-borne diseases.

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Frequency of E.coli and Vibrio Cholera in Water Samples from Filtration Plants of Lahore District

Nasir Waqar Ahmad Nasir,¹ Saima Ayub,² Ubaid Ullah Qazi,³ Rafia Abbas,⁴ Khadija Muneer⁵

Abstract

Background: Waterborne diseases, often linked to fecal contamination and the presence of pathogens like *Vibrio Cholerae*, remain a significant health concern. **Objective:** This study aims to find out frequency of Fecal Contamination and *Vibrio Cholera* in water samples from filtration plants.

Material and Methods: A cross sectional study was conducted on 100 filtration plants in ten towns of District Lahore. The study included 100 filtration plants from 10 Towns. A sum of 200 samples was taken, of which 100 samples were taken from taps of filtration plants and 100 samples from the source of these filtration plants. All data was entered in SPSS version 25.0. Data was analyzed applying frequencies (percentages) for qualitative variables and Mean Standard Deviations were calculated. Chi Square test was used to see any association between the attributes.

Results: Fecal contamination at tube well level was 68(68%) out of 200 water samples while fecal contamination at Filtration Plants was 58(58%) whereas post filtration fecal contamination (Houses) was 36 (36%). *Vibrio Cholerae* isolation at tube wells, at filtration plants, and houses were nil that is 0 (0%). It was found that (29.4%) of the contaminated tap samples had some sort of sewerage drainage in vicinity as compared to (63.9%) of those tap samples which were not contaminated ($p=0.009$).

Conclusion: Samples collected from the taps of filtration plants showed evidence of fecal contamination. And among the samples of collected from sources/tube wells of the filtration plants half of them showed fecal contamination.

Key words: Water filtration plants, *Vibrio Cholera*, fecal contamination, waterborne diseases, Lahore.

Introduction

The Quran emphasizes the significance of water as a fundamental element for all living beings, underscoring its vital role in sustaining life. However, global water pollution has become a pressing issue, endangering human health by causing waterborne diseases. Despite Earth's abundant water resources, pollution from various sources like power generation, industrial production, agriculture, and mining has severely limited the availability of safe drinking water, leading to diseases such as diarrhea and hepatitis.¹

In Pakistan, access to clean drinking water is a basic right, yet only a small percentage of the population has access to it. The importance of safe, pathogen-free, colorless, odorless, and tasteless water for daily life

cannot be overstated. Unfortunately, pollutants, including toxic substances, organic and inorganic contaminants, and microbial pathogens, have infiltrated water sources, posing a significant threat to public health.² The dire situation calls for immediate attention and comprehensive efforts to ensure that everyone has access to safe and clean drinking water.

The severe implications of this dire situation necessitate urgent attention and comprehensive efforts to ensure universal access to safe and clean drinking water. In a country like Pakistan, where only a small fraction of the population enjoys the privilege of accessing clean drinking water, the need for action is more pressing than ever.³ The importance of safe, pathogen-free, colorless, odorless, and tasteless water in daily life cannot be overstated, and the availability of such water should be considered a basic human right. The profound disparity between those with access to clean water and those

1. DHQ Hospital, Narowal

2-5. Institute of Public Health, Lahore

without paints a somber picture that demands immediate and sustained action.⁴

Lahore, as one of Pakistan's major urban centers, stands as a microcosm of the water-related challenges faced on a larger scale. With a soaring population and a century-old sewerage system, Lahore grapples with the grave risk of water contamination. The influx of rural migrants into the city further complicates the issue, as outdated infrastructure and waste management struggles to cope with the growing demand for clean water.⁵ This, in turn, puts the population at permanent risk of waterborne diseases and poses a severe threat to the environment and ecosystems.

In light of these circumstances, it is evident that tackling water pollution and ensuring access to clean water are not just matters of convenience; they are fundamental imperatives for safeguarding public health, enhancing the quality of life, and preserving the environment. These challenges are not unique to Lahore but reflect a global issue that demands both national and international commitment to ensure that the vital right to safe drinking water becomes a reality for all, in line with the principles of the United Nations' Sustainable Development Goals. The study aimed to assess the prevalence of waterborne diseases, specifically Acute Watery Diarrhea, in Lahore, where no reliable data on such diseases' incidence was previously available, contributing to a better understanding of the region's health status and water quality-related risks.

Materials and Methods

This cross-sectional study was conducted in Lahore District, Pakistan, spanning three months from July 1, 2022, to September 30, 2022. It involved the collection of 200 water samples from filtration plants, their sources, and houses supplied by the Water and Sanitation Agency (WASA). Water samples were collected using sterilized glass bottles equipped with glass stoppers. Prior to sampling, hands were thoroughly washed for five minutes. The taps were cleaned, and water was allowed to run for at least five minutes before filling the bottles. The bottles were filled without splashing and not to the brim, typically containing 120ml of water. All samples were transported to the IPH Water Testing Laboratory, Lahore, as soon as possible, packed in ice within specified time limits according to WHO criteria. The samples were divided into two categories, pre-filtration, and post-filtration, with 100 samples each, and analyzed for the presence of *Vibrio cholera* and *E. coli*.

Data was collected through interviews with filtration plant operators and questionnaire-based surveys in ten administrative towns of Lahore. Statistical analysis was performed using SPSS version 25.0, including descriptive statistics, chi-square tests, and a significance level of $p < 0.05$.

Results

In this study, 200 water samples were collected from filtration plants, their sources, and houses in Lahore District. Out of these, 58% of samples from tap water of filtration plants were contaminated with *E. coli* (Table 1). Pre-filtration samples from tube wells showed a higher contamination rate of 68%, while post-filtration samples from filtration plants had a contamination rate of 58%. Fecal contamination was more prevalent in pre-filtration (tube wells) samples at 68% compared to post-filtration (filtration plants and houses) samples, which had rates of 58% and 36%, respectively.

The study also explored factors associated with water contamination. It found that the presence of sewerage drainage in the vicinity was significantly associated with tap sample contamination (Table 1). However, other factors like the presence of toilets, washing areas, chemical factories, and alternate sources of electricity during load shedding did not show statistically significant associations with contamination. Filtration plants maintained by WASA had a contamination rate of 61.8% compared to 38.2% for those maintained by others. Distance from residence and the age of water sources did not significantly influence contamination rates (Tables 2 and 3).

Overall, the study highlights a concerning level of water contamination in Lahore, particularly in pre-filtration sources. It underscores the importance of water quality monitoring and maintenance of filtration plants to ensure safe drinking water for the population.

Discussion

Access to clean and safe drinking water is a fundamental human right, crucial for the well-being of individuals in both urban and rural areas.⁶ In Lahore, a rapidly growing urban center with a population of 11 million, the migration from rural to urban areas has exacerbated the challenges of ensuring the availability of safe water.⁷ This cross-sectional study aimed to assess the frequency of *E. coli* and *Vibrio Cholera* contamination in water supplied by filtration plants across ten administrative

Towns of Lahore District and identifies factors contributing to this contamination.

A study was done by Muhammad Saeed Anwar and his associates in 2010 from April-May⁸ in which 530 samples of water from lower to middle-class living areas were collected within 120 minutes all samples were taken to a lab, where tests were performed. Bacterial contamination was found in 37.2% of total collected water samples, low socio-economic. This was better related to studies performed in year 1995 whose result was 60.8% and 42.85% in 1999. In WDS (water distribution system) sewage discharge primary source of contamination. While toxins and chemicals are released by industries, pesticides, and fertilizers are considered to be the secondary source.⁹ This accounts for 33% of all deaths and almost 80% of all diseases.¹⁰ In the current study source of most of the filtration plants was inrush WASA tube wells. A sum of 87 Water samples was taken from the source (tube wells). Out of which 14(50.6%) showed positive results for E coli and 43(49.4%) were not contaminated. most probable cause of the contamination was due to sewerage water with drinking water

supply, old and rusty pipes, and leakage of pipes. This fact can be supported by a study which was conducted by Bari and Roky concluding the presence of vibrio cholera and E. coli in the samples tested.¹¹

The study underscores the urgent need for improved water quality monitoring, infrastructure maintenance, and better filtration technologies in Lahore. Ensuring the provision of clean and safe drinking water should be a top priority for public health authorities.¹² By addressing these issues and implementing effective water management strategies, Lahore can reduce the risk of waterborne diseases and safeguard the health of its growing urban population.

Conclusion

Taps of filtration plants showed evidence of fecal contamination. And among the samples collected from sources tube wells of the filtration plants half of them showed fecal contamination. It was found that (29.4% of the contaminated tap samples has some sort of sewerage drainage in vicinity as compared to (63.9%) of those tap samples which were not contaminated (p=0.009)

Table 1: Frequency of fecal contamination of Vibrio Cholera from Water Samples taken from tube Wells and Filtration Plants/Houses.

Test Applied	Tube Well/Source				Filtration Plant/Home				Grand Total	
	Positive		Negative		Positive		Negative			
	n	%	n	%	n	%	n	%	n	%
Fecal Contamination	68	68	32	32	58	58	42	42	200	100
Vibrio Cholera	0	0	100	100	0	0	100	100	200	100

Table 2: Comparison of Mean Various Variables on basis of Fecal Contamination in the Water Sources

Variables	Fecal Contamination Positive	Fecal Contamination Negative	Independent t-test	p value	Remarks
	Mean ±SD	Mean ±SD			
House Size (Marlas)	4.40±2.743	3.96±1.954	1.629	0.104	Not Significant
Number of Rooms	3.27±1.600	3.13±1.592	0.859	0.391	Not Significant
Number of Washrooms	1.88±0.913	1.85±0.940	0.237	0.813	Not Significant
Hand Washing Time (Seconds)	20.81±9.780	17.81±7.780	3.300	0.001	Significant

Table 3: Comparison of Means of Various Variable on Basis of Fecal Contamination in Filtration Plant/ Home

Variables	Fecal Contamination positive	Fecal Contamination Negative	Independent t-test	p value	Remarks
	Mean ±SD	Mean ±SD			
House Size (Marlas)	4.48±2.013	4.21±2.408	0.777	0.438	Not Significant
Number of Rooms	3.42±1.488	3.32±1.820	0.347	0.729	Not Significant
Number of Washrooms	1.98±1.033	2.00±1.143	0.088	0.930	Not Significant
Hand Washing Time (Seconds)	19.17±8.838	21.84±8.596	1.780	0.077	Not Significant

The higher authorities and policy makers should pay attention on execution of water surveillance system for better health and better Pakistan because access to safe and clean water is human right of public.

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