

Research

Maternal hygiene practices amongst mothers of infants and young children in Mohali (Punjab): A cross sectional study

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Abstract

The United Nations (UN) General Assembly recognized the human right to water and sanitation in 2010, emphasizing the importance of sufficient, safe, acceptable, physically accessible, and affordable water for all individuals. Ensuring these criteria is vital for the health and well-being of communities, particularly infants and young children. This study aims to assess WASH practices amongst mothers of children aged 0-2 years in Mohali District, Punjab, India, and their implications for child health during the COVID-19 pandemic. During the administration of questionnaire, prevailing perceptions and practices about breastfeeding were assessed. This would identify the need for targeted education and support initiatives to ensure informed decision-making among mothers. Our findings also revealed appropriate WASH practices amongst majority of surveyed mothers (88.4%). This was found to be closely linked to their educational qualifications. Maternal education and awareness about appropriate WASH practices and importance of COVID vaccination for mothers of infants and young children may play a pivotal role in implementing WHO recommendations. Furthermore, the research highlights the necessity of continuous monitoring and evaluation of WASH practices among mothers, as they are the primary caregivers for their children. Inadequate hygiene practices among women can have profound consequences on child nutrition and overall health. Therefore, proactive interventions to enhance WASH practices among women are crucial for the future well-being of society.

INTRODUCTION

The emergence of the COVID-19 pandemic brought about unprecedented challenges to public health worldwide. India, with its dense population and diverse socio-economic landscape, faced unique challenges in controlling the spread of the virus. While various measures such as lockdowns and social distancing were implemented to curb transmission, the importance of Water, Sanitation, and Hygiene (WASH) practices became increasingly evident.

WASH practices have always been integral to public health, but the COVID-19 pandemic underscored their critical role in preventing the spread of infectious diseases. The virus, primarily transmitted through respiratory droplets, also highlighted the potential for fomite transmission through contaminated surfaces. Proper handwashing with soap, access to clean and safe drinking water, and improved sanitation facilities became essential components of preventive strategies. Infants and young

children, due to their developing immune systems and exploratory behaviours, are particularly vulnerable to infections, including COVID-19. Moreover, mothers play a pivotal role in caregiving and setting hygiene practices within households. Understanding the knowledge and practices of WASH among mothers of infants and young children during the COVID-19 pandemic is crucial for designing effective public health interventions.

The United Nations (UN) General Assembly particularly recognised the human right to water and sanitation in 2010 through resolution 64/292 (UNDESA, 2010). Everyone has the right to sufficient, continuous, safe, acceptable, physically accessible, and affordable water for personal and household use (UNDESA, 2010). 'Sufficient' indicating that the water supply for each person must be adequate and continuous for personal and domestic uses. 'Safe' indicates every individual's or domestic use of water requires it to be

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safe, which means it must be devoid of microorganisms, chemicals, and radioactive risks that pose a threat to a person's health. Standards for drinking water quality at the local, state, and federal levels often establish measures of drinking water safety. The World Health Organisation (WHO) Guidelines for drinking-water quality serve as a foundation for the creation of national standards that, if faithfully carried out, will guarantee the safety of drinking water (WHO, 2017). 'Acceptable' implies water should be of an acceptable colour, odour and taste for each personal or domestic use. 'Physically accessible' suggests that everyone has the right to a water and sanitation service that is physically accessible within, or in the immediate vicinity of the household, educational institution, workplace or health institution. According to WHO, the water source has to be within 1,000 metres of the home and collection time should not exceed 30 minutes (UN-Water Decade Programme on Advocacy and Communication and Water Supply and Sanitation Collaborative Council, 2010). 'Affordable' implying water, and water facilities and services, must be affordable for all and should not exceed 3 per cent of household income as suggested by United Nations Development Programme (UNDP) (UNDP, 2010).

Nearly every aspect of infant and early childhood development is supported by sustainable WASH services in households, communities, hospitals, and schools. Therefore, in order to support the development of a happy, healthy child and mother, WASH services must be seen as a crucial part of early childhood initiatives. A healthy child must have access to WASH. These services not only benefit the mother and child's immediate safety and dignity, but also their long-term health, social, and economic well-being. The association between malnutrition and child development is very crucial in consideration of WASH since hunger may be the key mediator on the causal pathway between unsanitary settings and child development. Adequate nutrition during pregnancy and the first two years of life is required for normal brain development, which provides the groundwork for future cognitive and social abilities, academic performance, and productivity. Poor conditions of WASH are associated with 6.6% of the global burden of disease and disability, and 2.4 million deaths annually due to diarrhea, subsequent malnutrition, and their consequences (Ngunjiri et al., 2014).

The Lancet, Maternal and Child Nutrition Series, estimated that hygiene and sanitation interventions performed with 99 percent coverage would reduce diarrhoea incidence by 30 percent, resulting in a 2.4 percent reduction in stunting prevalence at 36 months of age. (The Lancet, 2008).

The UNICEF WASH Strategy for the period 2016-2030 (Figure 1) aims to guide UNICEF's efforts to enhance child rights in a constantly changing environment (UNICEF, 2016). Demographic trends are altering, with more than half of the world's population living in cities and migration accelerating — a major trend affecting society. The child population in poor and vulnerable countries is expanding, and more youngsters than ever before require humanitarian help. Inequalities in access to water and sanitation, for example, are evident and growing.

SDG 6- CLEAN WATER & SANITATION

6.1	By 2030, achieve universal and equitable access to safe and affordable drinking water for all
6.2	By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
6.3	By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
6.4	By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
6.5	By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
6.6	By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
6.A	By 2030, expand international cooperation and capacity-building support to developing countries in water- and sanitation-related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
6.B	Support and strengthen the participation of local communities in improving water and sanitation management

Figure 1. Components of SDG 6: Ensure Availability and Sustainable Management [UN SDGs]

In particular, for a developing nation like India, this data on the WASH practises used by mothers of children 0–2 years are required to assess the level of personal hygiene among mothers, which is directly or indirectly associated to the malnutrition of their children (B Varu, 2008). When conducting national level surveys in India, such as the National Family Health Survey (NFHS) and District Level Household Survey (DLHS), which only collect information on children under the age of five; the National Sample Survey Organisation (NSSO), which does not collect information on children; and the National Nutrition Monitoring Bureau (NNMB), which primarily surveys rural populations, WASH behaviour is not frequently studied. The absence of a standardised approach for evaluating WASH behaviours may be the cause of this information gap. As a result, studies based on WASH practises from Punjab (India) are almost non-existent. This research will help policymakers create thorough health and hygiene intervention programmes that will lessen the burden of malnutrition and communicable diseases in the nation. Therefore, it is important to evaluate WASH practices used by mothers.

RESEARCH QUESTION

To assess the practices of Water, Sanitation and Hygiene (WASH) amongst mothers of infants & young children aged 0-2 years during the COVID-19 pandemic in Mohali district of Punjab, India.

METHODOLOGY

The present study was a hospital based cross-sectional study. To ensure that the sample is representative of the population and to minimize selection bias, mothers visiting the hospital on the day of study for regular check-ups at Paediatrics OPD were included in the study. The data was collected for 500 randomly selected mothers of infants and

young children aged 0-2 years visiting out-patient departments of hospitals located in Mohali district (Punjab, India). Mothers with major anomalies like those suffering from metabolic syndromes and those who did not participate in the study were not included.

A self-designed questionnaire focussing on the objectives of the study was developed. The structured questionnaire containing well-defined questions was verbally administered by the authors in regional language (English, Punjabi & Hindi) as per the convenience of the respondent. The questionnaire included questions related to timings of hand wash, agents used, sterilization of nipple /bottle before feeding and administration of vaccine for COVID-19. Content validation involved reviewing relevant literature and seeking expert suggestions and comments in the questionnaire. A pilot study was also conducted on few respondents to validate the contents in the questionnaire. Various descriptive and inferential statistical techniques, including mean, range, frequency distribution, and t-test, were applied to analyse the collected data. These techniques were selected based on their appropriateness for addressing the research objectives. The data analysis was carried out in the context of different relevant studies and findings. This approach enabled a comprehensive understanding of the results and facilitated the derivation of meaningful conclusions.

RESULTS AND DISCUSSION

SOCIO-DEMOGRAPHIC PROFILE

In this study, the mean age of 500 randomly selected mothers is 26.43 years (± 3.162 years). 42.6% (n=213) respondents resided in Urban area while 57.4 % (n=287) respondents resided in rural areas in Mohali district of Punjab.

Table 1. Occupation of respondent mothers (n=500)

Occupation of Mother	Frequency	Percent
Unemployed	136	27.2
Elementary Occupation	56	11.2
Plant & Machine Operators and Assemblers	66	13.2
Craft & Related Trade Workers	73	14.6
Skilled Agricultural & Fishery Workers	41	8.2
Skilled Workers and Shop & Market Sales Workers	42	8.4
Clerks	19	3.8
Technicians and Associate Professionals	24	4.8
Professionals	25	5
Legislators, Senior Officials & Managers	18	3.6
Total	500	100

Socio-economic status, a widely studied construct in social sciences, is one of the most important social determinants of health and disease.

Using the Modified Kuppaswamy scale (Sood & Bindra, 2022), the socio-economic status of the respondents was calculated.

Amongst the mothers residing in rural areas, 32.8 % (n=94) mothers belonged to lower-middle, followed by 27.8% (n=80) belonging to upper-lower, 20.6 % (n=59) belonging to lower and least (18.8%) belonging to upper-middle(n=54) socio-economic status. None belonged to upper socio-economic status. Whereas, amongst the mothers residing in urban areas, 35.2% (n=75) mothers belonged to Upper-middle, followed by 24.4% (n=52) belonged to lower-middle, 22.1% (n=47) belonging to upper-lower, 10.3% (n=22) belonging to upper and 8% (n=17) least belonging to lower socio-economic status.

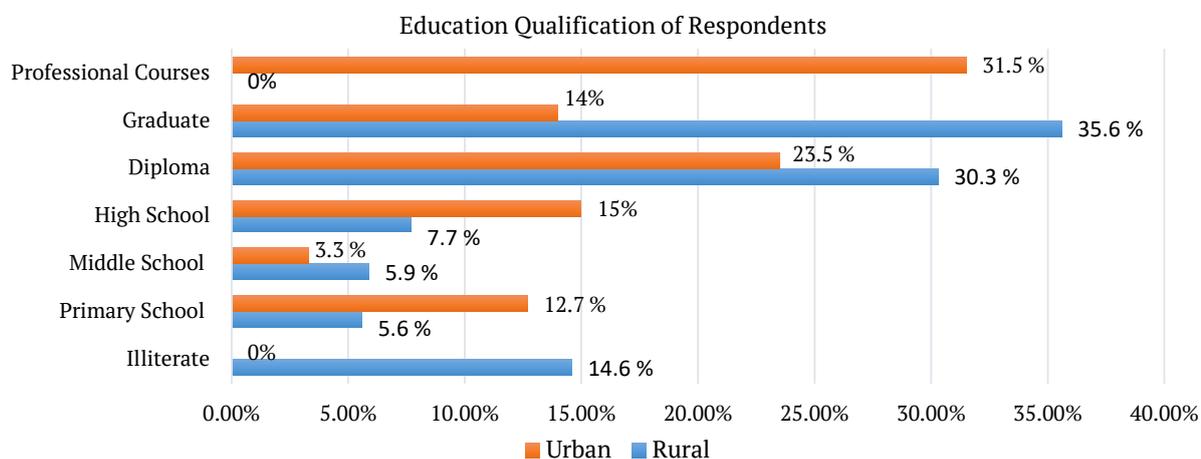


Figure 2. Educational Qualification of respondents residing in Rural and Urban areas (n=500)

Amongst the mothers residing in rural area, 33.8% (n=97) mothers were non-working while 66.2% (n=190) mothers were working. However, amongst the mothers residing in urban area, 18.3% (n=39) mothers were non-working while 81.7% (n=174) mothers were working.

It was also recorded by the authors that amongst 500 mothers, 69.6% (n=348) belonged to an extended family while others belonged to nuclear family.

WASH PRACTICES OF DURING COVID-19 PANDEMIC

During the COVID-19 pandemic, WHO and UNICEF encourage women to continue promoting breastfeeding, even if mothers have confirmed or suspect they may be

infected (WHO, 2020). They stress that the numerous benefits of breastfeeding outweigh the possible risks of disease associated with the virus, and that formula milk is not a safer or the only option.

During the administration of questionnaire, knowledge of the mothers was assessed regarding the breastfeeding practices during COVID-19. Amongst 500 respondent mothers, the majority (n=208) indicated a negative response,

expressing the belief that breastfeeding is not feasible if the mother tests covid positive. However, a noteworthy 21.2% of respondents (n=106) affirmed that breastfeeding could still occur in such circumstances. Additionally, a substantial 37.2% of mothers (n=186) expressed uncertainty about the possibility of breastfeeding when the mother is detected positive. (Refer figure 3).

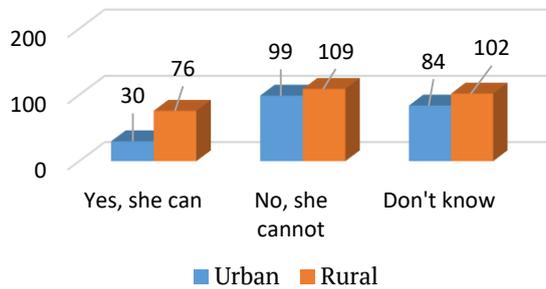


Figure 3. Knowledge of mothers regarding breastfeeding practices during COVID-19

Amongst the respondent mothers (n=500), only 8.6% (n=43) mothers breastfed their children during the COVID-19 pandemic period while 91.4% (n=457) did not. (Refer figure 4)

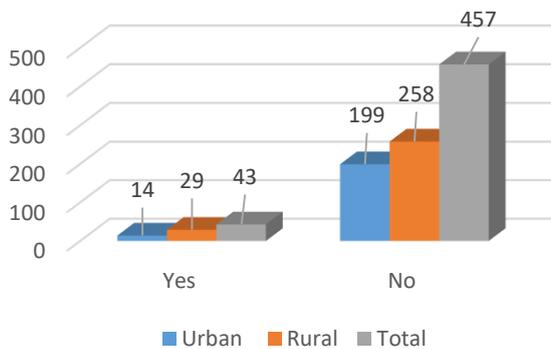


Figure 4. Number of respondent mothers who breastfed their child during COVID-19

87.6% (n=438) mothers were not vaccinated for coronavirus while only 12.4% (n=62) of mothers were vaccinated. When asked for reason for not vaccinating themselves, most respondents (n=380) assumed that they are pregnant/lactating and thus cannot be vaccinated, few mothers (n=12) believe that they are more prone to infections or will get severely ill, if vaccinated while others (n=46) had variable reasons like they did not take the doctor's advice or their family members did not allow or believed their child may be harmed when vaccinated. However, all respondents were explained the benefits of vaccination and suggested for the same.

Safe water, proper sanitation, and hygiene are necessary during infectious disease epidemics, such as the COVID-19 pandemic, to safeguard public health. Maintaining proper and regular WASH practices can additionally contribute to the reduction of COVID-19 virus transmission from person to person. While complementary food hygiene plays a significant role in mitigating infant exposure to enteric infections, food hygiene efforts in low- and middle-income countries frequently overlook the broader context of childcare settings.

WASH stands for Water, Sanitation, and Hygiene. UNICEF considers WASH as (1.) Water: Access to safe and clean drinking water is crucial for human health. It involves ensuring that people have a sustainable and reliable source of water that is free from contamination. (2.) Sanitation: Sanitation refers to the safe disposal of human waste and the provision of facilities and services to maintain a clean and healthy environment. Adequate sanitation helps prevent the spread of diseases and protects water sources from contamination. (3.) Hygiene: Hygiene practices, such as proper handwashing and personal hygiene, are essential for preventing the transmission of diseases. Promoting good hygiene behaviours contributes to overall health and well-being. (UNICEF)

However, in the present study, WASH refers to handwashing practices amongst mothers which may include any means of washing may it be using soap, sanitizer, ash, only water or any other means. It was found that 90.8% (n=454) mothers used soap and water to wash hands, 0.8% (n=4) mothers used only water, 2.2% (n=11) mothers used ash for washing hands while 6.2% (n=31) mothers used others means for washing hands.

During the study, respondents were asked about the events when they washed hands. On an average, 88.4% mothers followed WASH practices while performing various activities in the day It was reported that all of the mothers' (n=500) washed hands after using toilet, 97.8% (n=489) mothers washed hands before food preparation, 88.8% (n=444) mothers washed hands before cooking food, 75.2% (n=376) mothers washed hands before serving food, 81.2% (n=406) mothers washed hands before feeding the baby, 98.8% (n=494) mothers washed hands after changing baby's clothes while 97% (n=485) and 68.4% (n=342) mothers washed hands before and after eating food respectively. (Refer table 2)

In India, a country known for its rich cultural heritage and diverse culinary traditions, the common practice of eating with hands prevails. In Punjab, specifically, this practice is deeply rooted in the consumption of staple foods such as rice and chapati (Indian bread, which is eaten by tearing off a small piece using a thumb and fingers to create a small concave shape with the broken piece that helps in scooping the dal, curry or any side dish), where the tactile experience of using one's, hands enhance the connection with the meal. Beyond its cultural significance, this method of dining is also recognized for promoting a sensory engagement that extends beyond taste, encompassing touch and smell (Rakshak & Rakshak, 2024). However, it is crucial to note that due to this eating with hands while having food, it becomes imperative to emphasize the importance of hand hygiene. Hands are a major source of transmitting infections, it is recommended to wash hands during various activities food preparation (cleaning, chopping, dicing, segregating, cooking, assembling, etc.) and also both before and after eating to ensure the maintenance of hygiene and sanitation. Many studies (Demmelash et al., 2020; Parikh et al., 2021; Som et al., 2023) also discovered the linkages between WASH practices and Infant and Young Child Feeding Practices and its impact on Malnutrition. It was found that access to improved sanitation and adequate IYCF were associated with reduced risks of being wasted and stunted thus emphasizing upon the need for multisectoral intervention to reduce early childhood malnutrition.

Table 2. Tabular representation of WASH practices followed by mothers

	RURAL (n=287)		URBAN (n=213)		TOTAL (n=500)	
	Yes	No	Yes	No	Yes	No
After using toilet	287 (100%)	0 (0%)	213 (100%)	0 (0%)	500 (100%)	0 (0%)
Before Food preparation	281 (97.9%)	6 (2.1%)	208 (97.6%)	5 (2.4%)	489 (97.8%)	11 (2.2%)
Before cooking food	258 (89.9%)	29 (10.1%)	186 (87.3%)	27 (12.7%)	444 (88.8%)	56 (11.2%)
Before serving food	229 (79.8%)	58 (20.2%)	147 (69%)	66 (31%)	376 (75.2%)	124 (24.8%)
Before feeding the baby	233 (81.2%)	54 (18.8%)	173 (81.2%)	40 (18.8%)	406 (81.2%)	94 (18.8%)
After changing baby's clothes*	285 (99.3%)	2 (0.7%)	209 (98.1%)	4 (1.9%)	494 (98.8%)	6 (1.2%)
Before eating food	281 (97.9%)	6 (2.1%)	204 (95.7%)	9 (4.3%)	485 (97%)	15 (3%)
After Eating Foods	201 (70.0%)	86 (30.0%)	141 (66.2%)	72 (33.8%)	342 (68.4%)	158 (31.6%)
	Average Percentage				88.4%	11.6%

*After changing the baby's clothes' refers to the practice of mothers washing their hands in the specific context of removal of clothing of infant's. This encompasses various scenarios such as attending to clothing, soiled during feeding, playing or addressing any other instances that necessitate a change in the baby's attire, undergarments, changing nappies or panties as well as changing diapers.

The guidelines provided by the World Health Organization and the United Nations Children's Emergency Fund (WHO/UNICEF) for Infant and Young Child Feeding (IYCF) have been put into practice. These guidelines emphasize key recommendations, such as initiating breastfeeding within the first hour of birth, exclusively breastfeeding for the initial six months, continuing breastfeeding for up to two years, and introducing safe and nutritious complementary foods at the age of six months (WHO, 2010). It was reported that majority mothers residing in both urban and rural areas thoroughly cleaned and sterilized infant feeding bottles/nipples of the bottle before feeding. (Refer figure 5)

Water, Sanitation, and Hygiene (WASH) practices play a pivotal role in ensuring the hygiene of infant feeding. Clean water sources are essential for preparing food, minimizing the risk of waterborne illnesses that can harm infants. Sanitation facilities and proper waste disposal contribute to maintaining a clean environment during diaper changes and feeding times. Additionally, promoting handwashing practices among caregivers is crucial in preventing the transmission of harmful pathogens to infants. WASH interventions collectively empower caregivers to create a hygienic setting, reducing the risk of infections and promoting the overall health and well-being of infants during their critical developmental stages.

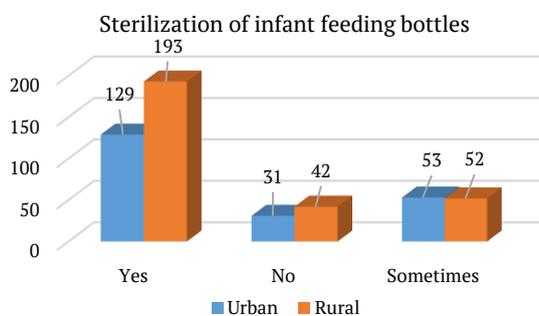


Figure 5. Distribution of mothers' sterilization the infant feeding bottles

Since milk is the ideal medium for bacterial development, contaminated feeding equipment can be a major source of infection for infants. According to reports, *Salmonella* and *Enterobacter sakazakii* (Food and Agricultural Organization,

2006) are the species of greatest concern. The Centres for Disease Control and Prevention (Centres for Disease Control and Prevention, 2023) offer suitable instructions for hand washing baby feeding equipment and sterilization procedures for added safety in an effort to lessen contamination with these organisms.

The data shows that a significant portion of mothers sterilize the bottle before using it to feed their child. The percentages vary based on the mother's educational qualification, with a higher percentage of educated mothers practicing sterilization. The trend observed with the given data is that as the level of education of mothers increases, the likelihood of sterilizing the bottle before use also increases. It is also noteworthy that approximately equal percentage of illiterate and graduate mothers are practicing sterilization. The p-value for response related to sterilizing the bottle before use was found to be 0.01 (<0.05), hence response related to sterilizing the bottle before use has a significant relationship with educational qualification of mother at 5% level of significance. (Refer Table 3)

Appropriate knowledge regarding hygiene practices proves to be helpful for a majority of mothers as recorded during the interview schedule. Respondents shared that demonstration of proper techniques through face-to-face communication in their region or through YouTube videos and distribution of pamphlets given for guidance are a great help for them.

While the data suggests that mothers with professional courses have a lower percentage of sterilizing bottles before feeding their infants (41.8%), it's important to note that making broad generalizations about a group of individuals based solely on their educational qualification can be misleading. There could be several reasons for this observation, and it's essential to consider various factors that might influence hygiene practices among mothers, even those with professional qualifications. Some possible reasons for this could include cultural or socioeconomic factors. It is also possible that mothers with professional qualifications may have busy schedules and demanding jobs, leaving them with limited time and energy to follow stringent hygiene practices. They might feel time-pressed and opt for convenience over thorough sterilization.

An efficient way to prevent/decrease the threat of infectious diseases is to wash the hands with water and soap (Mihalache et al., 2023). According to several studies, washing the hands with soap lowers the likelihood of respiratory infections by 21 to 23% (Freeman et.al, 2014) and diarrhoeal disease by 23 to 48% (Cairncross et al., 2010). According to research, those who wash their hands before handling food encounter less foodborne diseases than people who don't (Ali et al., 2014). Awareness about the significance of handwashing with soap and use of sanitizer to curb the spread of viruses was fostered through extensive public health campaigns during the COVID-19 period. Health professionals and community leaders played pivotal roles in educating individuals on proper handwashing techniques and its role in disease prevention and thus to safeguard personal and community health (Figure 6).

In the present study, it was found that most of mothers irrespective of their educational qualification preferred to use soap and water as the agent for washing hands. As p-value for agent used for washing hands was 0.264 (>0.05),

hence agent used for washing hands has a non-significant relationship with educational qualification of mother at 5% level of significance. (Refer Table 4)

It is also possible that public health education and awareness campaigns may have effectively promoted the use of "soap with water" for handwashing across all educational levels. This education is available to a large portion of the population, reducing disparities in handwashing practices. It is also likely that individuals may adopt handwashing practices based on what they observe in their immediate surroundings doing rather than solely based on their educational qualification.

It was also reported that agent used for washing hands has a significant relationship with residence of mother (urban or rural areas) at 1% level of significance as the p-value for agent used for washing hands was found to be <0.01 (Refer table 5). During interview, majority of mothers reported that their choice of agent used for washing was dependent upon the popularity and availability of that agent.

Table 3. Association of sterilizing the bottle/ nipple before bottle feeding the child with educational qualification of mother

	Illiterate	Primary	Middle	High	Intermediate	Graduate	Professional Courses	Total
Yes (n)	27 (64%)	28 (65%)	12 (50%)	38 (70%)	97 (71%)	92 (69%)	28 (42%)	322 (64.4%)
No (n)	9 (21%)	6 (14%)	6 (25%)	8 (15%)	13 (10%)	17 (13%)	14 (21%)	73 (14.6%)
Sometimes (n)	6 (14%)	9 (21%)	6 (25%)	8 (15%)	27 (20%)	24 (18%)	25 (37%)	105 (21%)



Figure 6. Efforts by Health professionals and community leaders in educating individuals during COVID-19 pandemic

Table 4. Association of choice of agent used for washing with educational qualification of mother

	Illiterate	Primary	Middle	High	Intermediate	Graduate	Professional Courses	Total
Water only	0 (0%)	1 (0.2%)	0 (0%)	0 (0%)	1 (0.2%)	1 (0.2%)	1 (0.2%)	04 (18.8%)
Soap + Water	40 (8%)	37 (7.4%)	23 (4.6%)	51 (10.2%)	132 (26.4%)	114 (22.8%)	57 (11.4%)	454 (72.8%)
Ash	1 (0.2%)	2 (0.4%)	1 (0.2%)	1 (0.2%)	1 (0.2%)	3 (0.6%)	2 (0.4%)	11 (2.2%)
Other	1 (0.2%)	3 (0.6%)	0 (0%)	2 (0.4%)	3 (0.6%)	15 (3%)	7 (1.4%)	31 (6.2%)

Table 5. Association of residence of mothers with their choice of agent for washing hands

	Soap +Water	Water only	Ash	Other	Total
Urban	190 (38%)	4 (0.8%)	5 (1%)	14 (2.8%)	213 (42.6%)
Rural	264 (52.8%)	0 (0%)	6 (1.2%)	17 (3.4%)	287 (57.4%)
Total	454 (90.8%)	04 (0.8%)	11 (2.2%)	31 (6.2%)	500 (100%)

CONCLUSION

The association between Water, Sanitation, and Hygiene (WASH) practices and breastfeeding becomes even more critical during the COVID-19 pandemic. Proper WASH

measures are essential not only for maintaining a clean and safe environment but also for supporting optimal breastfeeding practices. WASH practices, especially regular handwashing with soap and water, are crucial for preventing

the spread of COVID-19. Mothers practicing good hand hygiene reduce the risk of transmitting the virus to themselves or their infants during breastfeeding, promoting a safe and healthy feeding environment. Reliable access to clean water is fundamental for various aspects of WASH, including handwashing, cleaning feeding equipment, and maintaining personal hygiene. Clean water ensures the safe preparation of food when needed, and it is essential for proper hydration of breastfeeding mothers, supporting the quality and quantity of breast milk. WASH practices contribute to maintaining a sanitary environment for diaper changing and baby care. By reducing the risk of infections through proper sanitation, infants are less likely to fall ill, supporting consistent and uninterrupted breastfeeding, which is crucial for building the infant's immune system. Proper cleaning and sterilization of breastfeeding equipment contribute to a hygienic feeding environment. Mothers can breastfeed with confidence, knowing that their breastfeeding equipment is clean and safe. This is particularly relevant for mothers who may express and store breast milk. WASH interventions that emphasize the benefits of exclusive breastfeeding, especially in the absence of safe water sources, become even more critical during a pandemic. Mothers may be encouraged to rely on breastfeeding as a safe and readily available source of nutrition, reducing the need for external sources of water or formula that might pose additional risks during the pandemic. Adequate WASH facilities contribute to the overall well-being of mothers, including mental health. A mentally healthy mother is more likely to initiate and sustain breastfeeding, promoting the emotional bond between mother and infant, which is crucial during times of stress and uncertainty.

Thus, WASH practices are intricately linked to infant feeding during the COVID-19 period. By ensuring access to clean water, promoting hygiene, and maintaining a sanitary environment, communities can support mothers in providing safe and optimal feeding for their infants, even in the midst of a global health crisis.

This research highlights a critical aspect of water, sanitation, and hygiene (WASH) practices among women. While a majority of the women in the study reported acceptable WASH practices, a notable minority did not adhere to these practices, and this deviation is closely associated with their level of education. Therefore, it is evident that educating women about the importance of WASH practices is of paramount significance. Moreover, the study underscores the importance of regular monitoring and recording of WASH practices among mothers, who play a pivotal role as caretakers for their children.

A more comprehensive understanding of implementation and nuances of WASH practices prevalent amongst respondent mothers and their evaluation necessitates use of observational methods to provide direct insight into the reported practices.

Suboptimal hygiene among women can have far-reaching implications on the nutritional status and overall health of their children. As such, proactive interventions to improve WASH practices among women can positively impact the well-being of future generations. Government, organizations

and communities must invest in strengthening WASH infrastructure and education systems to be better prepared for future health crises. Policy makers and practitioners must also conduct educational interventions for mothers with lower educational levels or community-based programs to improve access to WASH facilities.

It is recommended that in future longitudinal studies to track changes in WASH practices over time be undertaken. Additionally, intervention studies ascertaining the effectiveness of educational programs and awareness generation activities in improving WASH practices be conducted for sustainable improvements in public health and hygiene.

In conclusion, this research study highlights that WASH practices are not only relevant during a pandemic but are fundamental to maintaining public health and preventing the spread of infectious diseases. Education, awareness, and community engagement are critical components of an effective response. By recognizing the importance of WASH practices and implementing them appropriately, we can collectively work towards a healthier and more resilient society in the face of epidemics. Furthermore, initiating WASH education among children below 5 years of age serves as a valuable opportunity to instil the significance of personal hygiene and sanitation from an early age. By empowering the younger generation with this knowledge, we can lay the foundation for a healthier and more informed society in the future.

ABBREVIATIONS

DLHS- District Level Household Survey, NFHS- National Family Health Survey, NNMB- National Nutrition Monitoring Bureau, NSSO -National Sample Survey Organisation, SDG- Sustainable Development Goals, UN- United Nations, UNDESA- United Nations Department of Economics and Social Affairs, UNDP- United Nations Development Programme, UNICEF- United Nations International Children's Emergency Fund, WASH- Water, Sanitation and Hygiene, WHO- World Health Organization

AUTHOR CONTRIBUTIONS

Ritu Pradhan: Conceived, Conceptualized, Designed, and Guided the study; **Anupreet K. Sobti:** Data collection; **Ritu Pradhan and Anupreet K. Sobti:** Data Analysis, Interpretation of Data, Manuscript writing.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest/competing interests.

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