Unravelling context: a formative photovoice study of Indian youth perspectives of sanitation and hygiene practices

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Abstract: *Water, sanitation, and hygiene are issues of substantial public health importance. Community-based participatory research approaches such as photovoice can help explore and identify determinants that influence sanitation and hygiene-related behaviours. This study aimed to use photovoice as part of the formative research process to increase understanding of youth's perceptions of the cultural and contextual factors that influence sanitation and hygiene-related behaviours in Thirumalaikodi, India. First, a school was recruited using convenience sampling; next, 10 participants were purposively selected to participate in an information meeting, seven photo discussion sessions, and one wrap-up session over a three-week period. In each photo discussion session, participant groups selected one 'trigger' photograph, and through a structured discussion using SHOWED mnemonic questions (a series of questions that ask participants to describe and reflect upon a chosen photograph), generated a new understanding of issues related to water, sanitation, and hygiene. All sessions were audio-recorded and transcribed verbatim. Conventional content analysis was used to analyse photo discussion session text. Findings revealed that factors such as social structure, education, and culture influence behaviours that determine the sanitary conditions of an individual's private and public spaces. Furthermore, participants described how descriptive norms generated practices (e.g. littering) that were reinforced and maintained by limited access to waste management systems, attitudinal indifference, and generational beliefs. Findings yielded an in-depth understanding of youth's perceptions of the cultural and contextual factors that influence sanitation and hygiene-related behaviours. This study also contributes to the advancement of participatory applications in formative research and intervention adaptation processes.*

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POOR HYGIENE BEHAVIOURS AND INADEQUATE sanitation conditions are linked to several negative health outcomes such as parasitic worm infections, diarrhoeal disease, malnutrition, and stunting (Hall et al., 2008; Walker et al., 2012l Cumming and Cairncross, 2016l). Furthermore, studies demonstrate that there is an association between sanitation and hygiene and other outcomes such as impaired cognitive learning, school absences, and poor social development (Lau et al., 2012, Freeman et al., 2012). Therefore, improving water, sanitation, and hygiene (WASH) has been an integral part of the global health agenda. Evidence suggests that theory-based health promotion interventions that address determinants may lead to improved behavioural and health outcomes (Glanz and Bishop, 2010). Historically, WASH interventions were focused on infrastructure, for instance, hardware solutions including water treatment technologies, handwashing facilities, and improved toilets to increase latrine use (Peal et al., 2010). However, it has become increasingly recognized that there is a need for more comprehensive approaches to effectively address WASH challenges and achieve intended health outcomes (Dreibelbis et al., 2013).

India has prioritized improving sanitation infrastructure for decades, yet India is still a top contributor to the diarrhoeal disease burden, globally (UNICEF and WHO, 2009). Moreover, approximately 40 per cent of the population defecates in the open (WHO and UNICEF, 2017), which is often related to a lack of adequate sanitation infrastructure or preference for the practice (Doron and Raja, 2015). Additionally, India's rapid increase in population and urbanization generates an overwhelming 56 million tonnes of waste each year, of which less than 60 per cent is collected and only 15 per cent processed (Press Information Bureau, 2016). With several WASH-associated health concerns affecting the country, the government has worked to mitigate these sanitation and hygiene challenges with several initiatives such as the Central Rural Sanitation Programme, the Total Sanitation Campaign, and the Swachh Bharat Mission. However, despite these initiatives working towards successfully expanding sanitation coverage, behaviour change outcomes are still poor (Clasen et al., 2014; Bhattacharya et al., 2018).

Evidence regarding the behavioural and health impacts of other WASH interventions is still mixed (Watson et al., 2017; McMichael, 2019). Some studies report significant effects on behavioural and health outcomes; however, others demonstrate a modest impact. For example, studies on handwashing have found that perceived health benefits, attitudes, and other contextual factors influence handwashing behaviour (Dobe et al., 2013; Friedrich et al., 2017), while studies on waste management have found that access to trash collection services, normative beliefs, perceived responsibility, and age were all determinants of waste disposal practices and littering behaviours (Arafat et al., 2007; Bauza et al., 2019). This illustrates that factors that influence sanitation and hygiene-related behaviours are not well understood, highlighting the need for further research.

There is also a need to investigate behavioural determinants across different settings and populations to inform the development of culturally and contextually relevant interventions. One approach to explore behavioural determinants is through community-based participatory research (CBPR). CBPR approaches, such as photovoice, can help broker participant–researcher relationships to uncover the cultural and

contextual factors that influence determinants of sanitation and hygiene-related behaviours, which may enhance intervention effectiveness and sustainability (Cornwall and Jewkes, 1995). Although several studies have used the photovoice methodology to explore the personal experiences, perceptions, and challenges of youth, there are comparatively few photovoice studies that focus on water, sanitation, and hygiene and none in the southern Indian context. Furthermore, to our knowledge, no study has explored youth perspectives of the underlying mechanisms of behaviours (behavioural determinants) to adapt and tailor intervention strategies to youth in the Indian context. This formative research will fill an important gap in the knowledge base both concerning how CBPR can be used to elicit youth perspectives on WASH and on how findings can be used to inform the development and adaptation of a culturally relevant WASH health promotion intervention.

The purpose of the present study was to explore students' perceptions of the cultural and contextual factors that influence sanitation and hygiene-related behaviours through photovoice. This knowledge will contribute to the adaptation of Project SHINE (Bastien et al., 2016) (Sanitation Hygiene INnovation in Education) to the local context of Thirumalaikodi, Tamil Nadu.

Methods

Study area and participants

The present study is a part of Project SHINE (more information is available at www.project-shine.net). This study was implemented at a private English medium school (1st–12th standard) in the rural community of Thirumalaikodi, which is in the Vellore district in the southern Indian state of Tamil Nadu. Thirumalaikodi is well known for its spiritual significance because of its proximity to the Sri Lakshmi Narayani golden temple. Participants in this study were male and female students, aged 13–15 years in 7th, 8th, and 9th standard (grade), and primarily resident throughout the Vellore district. However, one student dropped out after the sixth photo discussion session (PDS) due to scheduling conflicts. The Vellore district is made up of 858 villages and 36 towns, with a total population of 3.9 million (Directorate of Census Operations Tamil Nadu, 2011). In Vellore, 22 per cent of the population identified as Scheduled Caste while 2 per cent identified as Scheduled Tribe, both slightly higher than in the population of the entire state of Tamil Nadu (20 per cent and 1 per cent, respectively) (Directorate of Census Operations Tamil Nadu, 2011).

Recruitment

A convenience sampling strategy was employed to select a school. First, the school was recruited to participate in the larger SHINE study based on demonstrated interest by the local community and a partnership between the University of Calgary and the Sri Narayani Hospital and Research Center. Next, using a purposive sampling strategy, the school principal and teachers recruited 10 students who met the following inclusion criteria: 1) currently enrolled as a student at the school; 2) in 7th, 8th, or 9th standard; 3) willing to take photographs of their community

Table 1 Photovoice participants' demographic data

	Sex	Grade	Location
Participant 1	Girl	9	Vellore District
Participant 2	Girl	9	Vellore District
Participant 3	Girl	9	Vellore District
Participant 4	Girl	8	Vellore District
Participant 5	Girl	8	Vellore District
Participant 6	Girl	7	Vellore District
Participant 7	Girl	8	Vellore District
Participant 8	Boy	9	Vellore District
Participant 9	Boy	9	Vellore District
Participant 10	Boy	8	Vellore District

and/or experiences; 4) comfortable expressing themselves in English (the language of instruction at the school); and 5) open to sharing their experiences within a group of peers. The study was conducted at the school selected for future intervention implementation of Project SHINE. Table 1 provides a summary of participant demographic information.

A relationship between study participants and the researcher team is essential to establish trust and rapport in CBPR and was key to producing quality data in this study. Although there was no formal relationship between researchers and participants prior to data collection, we hoped to promote trust and respect through informal exchanges such as introducing the research team to students and teachers at the all-school assembly and additional classroom introductions and/or visits before data collection.

Data collection

Photovoice is a method in which individuals are provided with cameras to take pictures, so they can represent, reflect upon, and communicate their personal experiences (Wang and Burris, 1997). According to Wang and Burris (1997), two pioneers of the photovoice method, the three main goals of photovoice are to 1) allow participants to take photographs that reflect their experiences; 2) engage participants in dialogue about community issues; and 3) reach influencers to stimulate change. The method was developed on the basis of feminist theory, Freirean principles, and documentary photography (Wang and Burris, 1997). In this study, photovoice was used as an approach to engage youth in the formative phase for the Project SHINE intervention adaptation. Participants took photographs that captured cultural and contextual factors that influence sanitation and hygiene-related behaviours, as well as highlighting their community's strengths, challenges, and needs through a group process of critical reflection and dialogue.

Data collection took place from June to July 2017. Participants attended one information meeting, seven PDSs or focus group discussions, and one wrap-up meeting

over a three-week period. All sessions were conducted in English; however, a translator fluent in Tamil was present during the information meeting to help facilitate and answer clarifying questions. PDSs were held at the school, during the last period of the school day which is often intended for extracurricular activities. Moreover, PDSs were conducted in a private classroom with the blinds/door shut, to prevent others from observing or overhearing participant discussions. These measures also helped foster a safe, private, and secure environment for study participants to share openly. The purpose of the information meeting was to acquaint participants with the study and the photovoice method (Sutton-Brown, 2014). In this meeting, participants were taught the ethics of photography, discussed how data and identities would be protected, their right to withdraw at from the study at any time, trained how to use digital cameras, and how to obtain informed written consent when taking photographs of people (Wang and Burris, 1997). Participants were advised that informed written consent and/or parental consent and assent for minors must be obtained before they took a photograph of a person's face or any other identifiable feature. Participants were subsequently given specific consent forms and information sheets (for individuals in photographs) and required to obtain written consent before taking photographs of individuals during photo assignments. Furthermore, in the initial information meeting participants established group agreements (e.g. group norms) and selected pseudonyms to be used throughout the PDSs to foster a supportive environment conducive to sharing opinions and personal experiences. After the information meeting, participants were separated into single-sex groups, to ensure that they would be comfortable talking about sensitive topics with peers.

All PDSs followed the same procedure in both groups; however since groups were conducted separately, photo assignments generated by participants varied. All PDSs were facilitated by the first author (AGW) and lasted for approximately one hour. Figure 1 depicts the activities which comprise this photovoice study. There were increments of 2–3 days in between PDSs (with assignments between discussion sessions) and students took cameras home to complete photo assignments in their community. Prior to each PDS, participants were requested to select one or two photographs to share with the group and discuss why they took the photo. After all participants shared their photographs, the entire group voted anonymously for one photograph to discuss in-depth using the SHOWED technique (Shaffer, 1985). SHOWED is a Freirean-based inductive questioning technique that is used to 'trigger' critical dialogue. The technique helps participants make linkages between the photographs discussed and each individual's personal experiences (Sutton-Brown, 2014). Furthermore, SHOWED guides participants to discuss and reflect upon potential action (Sutton-Brown, 2014).

At the end of each session, participants developed their next photo assignment by connecting keywords or concepts, with the guidance of AGW. Since both groups attended the initial information meeting together, they followed the same photo assignment for the first PDS (see Table 2 for photo assignments by group). After seven PDSs, it became apparent that both groups were generating similar topics and discussions, indicating we had reached data saturation. In total, 14 PDSs were conducted (seven for each group).
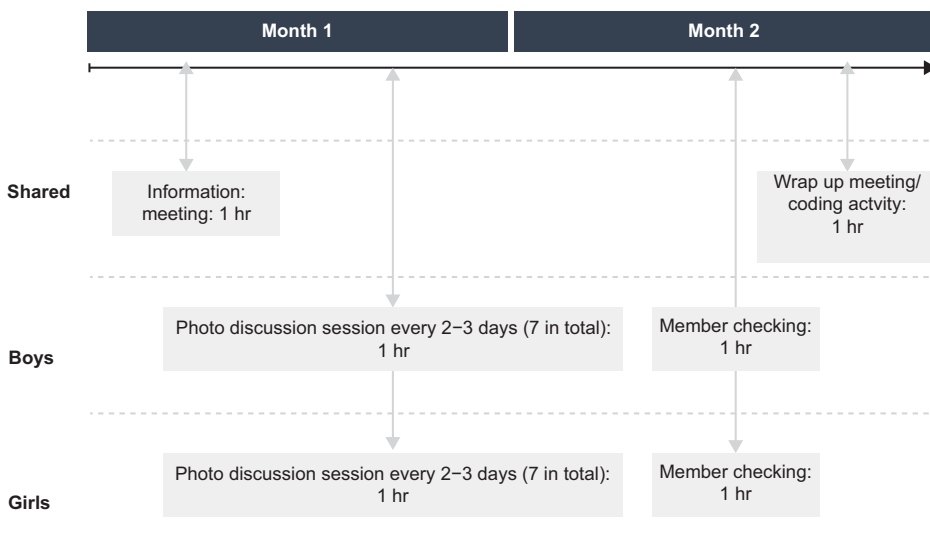
Each participant took on average 7 photos for each photo discussion session (PDS). In total, 468 pictures were taken.

Figure 1 Photovoice study timeline

Table 2 Photo assignments developed by participants in each group

Photo assignment	Male group	Female group
1	What is sanitation and hygiene?	What is sanitation and hygiene?
2	How do people get disease from poor sanitation and hygiene?	How does pollution affect waste?
3	What makes something unhygienic?	What factors can we improve to make India a more developed country?
4	How do diseases spread from water?	What habits do people have that are not hygienic?
5	What are good and bad hygiene habits?	What habits do I have to keep myself hygienic?
6	Where do people get their sanitation and hygiene information?	Where do we learn about our health information?
7	How can we make sure food and water are clean?	What are the traditional practices related to sanitation, hygiene, and health?

Data analyses

Each PDS was audio-recorded, transcribed verbatim, and transferred to qualitative research software, Atlas.ti (2017). We used an inductive approach and conventional content analysis to analyse PDS text to capture the direct insights of study participants without 'imposing' preconceived ideas or theoretical perspectives (Hsieh and Shannon, 2005). There were several stages within the analysis process. First, AGW immersed herself in the text by reading through transcripts to become familiar with

the data (Tesch, 2013), then, after reflection, developed the initial codebook through an open-coding process (Hsieh and Shannon, 2005). Codes were then organized into parent codes and sub-codes which comprised the initial codebook (Patton, 2002).

After the initial codebook was completed, in the wrap-up meeting, AGW presented the codebook to the study participants. Participants then engaged in a code verification exercise to ensure inter-coder reliability. In this exercise, participants coded parts of transcripts, added codes they felt were missing and contributed general feedback. This process included a mix of individual and group work and was informed by previously established group agreements to foster a supportive environment that encouraged collaborative thinking and ensured that all participants were engaged. Next, AGW continued analysis with second-cycle coding using the revised codebook (Saldaña, 2015). Meaning units with similar content were then organized into sub-themes and with further interpretation, AGW merged sub-themes to generate overarching main themes. AGW also conducted two additional member-checking sessions to ask participants follow-up questions and further refine themes. Participants then used subsequent sessions to develop an action plan to create social change in their community.

Ethical approval

The study protocol was approved by the Norwegian Centre for Data Research (reference number: 53162) in Norway and the Institutional Ethics Committee/Institutional Review Board at the Sri Narayani Hospital and Research Centre in India (reference number: 30/25/02/17). Due to the age of participants, students were required to provide assent and active written consent of a parent or caretaker to participate in the study. Furthermore, all participants and individuals in photographs presented in this article have granted permission for the research team to use their photograph(s) in research publications**.**

Results

Throughout the PDSs (see Table 2 for photo assignments), critical dialogue among participants revealed that several determinants play an influential role in sanitation and hygiene-related behaviours that determine the sanitary conditions of one's private space (in the household or domestic settings) and public spaces (outside of domestic settings/in communal environments). This relationship is mediated by norms, attitudes, or beliefs. Some of the excerpts presented have been edited or paraphrased for readability and grammatical correctness, including removal of distracting phrasing and identifying information. All major changes are indicated by square brackets.

Causes and consequences: nexus between descriptive norms, behaviour, and outcomes

This theme describes both participant's observations and perceptions of what causes normative sanitation and hygiene-related behaviours, and their positioning of these behaviours as negatively affecting the physical environment

and health of the community. Two sub-themes emerged ('Bad habits': litter(ing) as a descriptive norm and 'Why should we care?': displaced responsibility and indifference).

'Bad habits': litter(ing) as a descriptive norm. Norms influence behaviour, which often determines what is socially acceptable. Additionally, normative influence is guided by what one perceives is commonly performed (descriptive norms) or approved of (injunctive norms). Participants described how descriptive norms influence habits that contribute to the sustained practice of poor sanitation and hygiene-related behaviours such as littering. Both male and female participants shared their perceptions of littering behaviour as a 'bad habit' or 'dirty', demonstrating that littering is a descriptive, yet an unaccepted norm. For example, one photo (Photo 1) taken by a participant depicts a polluted stream that triggered a discussion about waste disposal habits.

One participant shared:

> The people are following [the] negative things of man. If a person puts garbage in water bodies, another person will think, why should we not put [garbage] in waterbodies? [Then] many people [will] follow them and it becomes a habit … (male participant).

As illustrated by this excerpt, although this participant describes this behaviour as common, it is conveyed as negative and therefore an unacceptable behaviour.

Photo 1 Participant photo of water source

Photo 2 Participant photo of the area near her home

Also, the participant suggests that when people act out behaviours they perceive are commonly practised, it becomes habitual, posing harm to the physical environment and health of the community.

In a separate PDS, another participant echoes similar sentiments when she describes a photograph (see Photo 2) she took near her home:

> This is the backyard of my home [next to] a government school. [The] government school land is [used for] waste dumping. Now mosquitos, rats, snakes come this side. The monkey go[es] there … All the ones in my house, we are [upset] all because of this. They have [facilities] but they didn't use [them]. They are using this place (female participant).

This quote further illustrates how improper waste disposal is a common yet unaccepted behaviour throughout the community and reflects how such practices pose various health threats to neighbouring residents.

'Why should we care?': displaced responsibility and indifference. Besides the reported perception that others commonly practise littering, participants also discussed how attitudinal indifference supported such behaviours. Participants described people as being 'careless', 'lazy', 'not interested', 'not worrying about others', or thinking 'why should we care?' regarding the physical presence of waste in public spaces and corresponding behaviours (e.g. littering and waste disposal). However,

although PDSs revealed that several participants perceived attitudinal indifference or 'laziness' as facilitating littering behaviours, structural factors such as sanitation infrastructure were also identified as playing an influential role. One participant shared: 'They want to put their garbages in the [dumpsters], which [are] a little bit far away from their homes. [However], they're putting garbages in this place, near [their] home' (male participant).

In this account, the participant describes how both an attitudinal indifference and a lack of infrastructure influence improper waste disposal behaviours. Moreover, participants discussed how, in order to practise sanitation and hygiene-related behaviours, there needed to be efficient and reliable sanitation or waste management infrastructure (e.g. sewage systems and waste collection). However, participants revealed that sanitation infrastructure was often neglected or poorly maintained, thus making habitual sanitation and hygiene-related behaviours arduous.

One participant also reflected on how community members weigh their civic responsibilities when engaging in sanitation and hygiene-negligent behaviours that cause environmental harm: '*They are not interested to do it. They are thinking, "Why should we do [it]?" This is not our duty. So, they are not thinking of the future*' (female participant).

This excerpt highlights tensions in local perceptions and civic responsibilities, illustrating a discrepancy in awareness, beliefs, and values among community members. Participants shared their regard for the physical environment and personal beliefs about how proper sanitation and hygiene behaviours can benefit both the physical environment and health, while also discussing how others may not consider the duty to the physical environment as beneficial to the overall community (e.g. physical environment and health), demonstrating variations in core beliefs and values.

Norms in transition

The theme, 'norms in transition' explores participants' reports of malleable contextual factors associated with culture, religion, and household dynamics that influence sanitation and hygiene-related behaviours. We identified two sub-themes under this theme, which were, 'linkages between cleanliness and godliness' and 'gender-role paradigm shifts'.

Linkages between cleanliness and godliness. Participants spoke about how in some households, sanitation behaviours within private space are influenced by socio-cultural or religious rituals that promote positive domestic hygiene practices. In both discussion groups, participants shared the religious and cultural importance of keeping their home clean. Photo 3 was taken for the male group's photo assignment 5 (Table 2) and was described as representing a sweeping ritual before sunset.

Participants elaborated that their homes will be cleaned regularly to respect deities. Participants also explained that keeping one's home clean would bring other benefits such as the deity entering the home and granting blessings to the dwelling's

Photo 3 Participant photo of a mother cleaning

inhabitants. This demonstrates a close relationship between domestic hygiene and local cultural or religious beliefs. One participant explained that to promote hygienic practices, it would be beneficial to emphasize the spiritual benefits of the practice to ensure maintenance. '*If we say that it is [about] hygiene, they will clean it for one day or two days … But if we say that God gives us more blessings, means that they will do it regularly*' (male participant).

This demonstrates how cleanliness and hygienic practices are interlinked to religious beliefs in this context. Gods may enter the home to give blessings to the inhabitants upon the condition that the home is kept clean. Moreover, participants suggest that to motivate sustainable behaviour change, it is important to understand the cultural and religious linkages of purity and cleanliness of the Divine, in this cultural context.

Gender-role paradigm shifts. Participants revealed that despite cultural and religious traditions, individuals experience multiple demands throughout their daily life making it difficult for them to engage in hygienic practices that affect sanitation within (private space) and outside (public space). In several PDSs, participants perceived employment as a top priority, which involves demanding schedules, commutes, and stamina. These responsibilities may not correspond with traditional domestic hygiene practices or duties. Male participants spoke about women joining the formal workforce, which largely affects traditional households. This potential

change in societal gender norms has permeated into household dynamics and domestic hygiene (e.g. housework or chores).

Both groups reported a shift in attitudes towards domestic hygiene; however, male participants specifically discussed how they observed a decline in women engaging in housework, rather prioritizing work outside the home, thus illustrating a shift in domestic priorities. Meanwhile, in the female group, participants shared how successful career ambitions influenced their own sanitation and hygiene-related attitudes and behaviours. The group discussed how much they value their personal hygiene because they are determined to get a good education, which is a key step for future achievements. One participant reflected:

> [I value] my future and my job. [If] a person is healthy, then only he can work. So, sanitation is good [for] him. Every day, we are coming to school, we are working, we should [be clean] and come. It's our duty. If we are getting germs that directly affect us, then [the] next day we will not be coming (female participant).

Despite these differing perspectives, both groups allude to different roles women play in the broader discourse on sanitation and hygiene. The male group discussed how emerging opportunities have taken women outside the home and shifted traditional household dynamics, while the girls discuss how they value sanitation because it supports education and successful job prospects. The female group perceived that without adequate sanitation and hygiene behaviours, one will be susceptible to disease, unable to attend school, and deprived of educational opportunities, which may prevent the further pursuit of a successful career.

Strategies for behaviour change

The application of the SHOWED technique also 'triggered' participants to discuss strategies that facilitate action. These 'strategies for behaviour change' addressed many underlying cultural and contextual factors associated with beliefs, norms, values, sanitation and hygiene-related knowledge. Two sub-themes that emerged included: 'generational beliefs and knowledge gaps: achieving health literacy' and 'future change agents'.

Generational beliefs and knowledge gaps: achieving health literacy. Given the influence of norms on sanitation and hygiene-related behaviours, participants shared how they perceived knowledge and education as significantly affecting sanitation and hygiene-related behaviours. Participants also reflected upon processes of knowledge sharing among older and rural populations, demonstrating the prominence and value of local health knowledge. One participant shared: 'From a small age, it's their habit, they won't think. They are [raised] in such a way. Maybe because of their elders, they didn't teach them' (female participant).

Here, participants describe how this generational knowledge transfer contributes to knowledge gaps and poor sanitation and hygiene-related behaviours.

Future change agents. Participants proposed several strategies to improve the community's sanitation and hygiene-related challenges that incorporated 1) education: 'we can advise them', 'create awareness'; 2) media advocacy: 'distribute this news to all of

them through WhatsApp or Facebook', 'make advertisements'; 3) policy: 'government should put an order that those who are polluting those waterbodies will be punished severely', 'request to the government to clean', 'go to each houses in the streets and check the cleanliness'; and 4) others: 'build a safety wall to protect the water', 'form a group to go clean', 'keep cameras and watch the people who are putting wastes in the area'. Although approaches varied, participants expressed hope in younger generations, wishing to educate their peers. One participant explains:

> The education department should put a rule to every school that they have to teach teenage students about hygiene, sanitation, [and] health. Regarding that, if they teach the teenage students, maybe [they can be] aware and they can advise to [their] neighbour and illiterate people (male participant).

This demonstrates how participants believe knowledge and school-based educational interventions can contribute to improving overall sanitation, hygiene, and health.

Participants often took photos of litter in public spaces, which prompted discussion about littering behaviours (causes, consequences, and solutions). Photo 4 was taken to represent individuals improperly disposing of waste in public space.

One participant revealed how attitudinal indifference reinforced or maintained improper waste disposal in their community while suggesting alternative strategies to this unfavourable behaviour. '*They think they can throw the rubbish … the trashes there … But if they plant the tree, it is good for them, but they are not thinking*' (female participant).

Photo 4 Participant photo of litter

Throughout the PDSs, participants shared how they valued the physical environment by discussing the medicinal significance of specific plants and nature's importance with comments such as, 'trees are good for us' and 'plants will help'. Here, this participant suggested that instead of improperly disposing of waste, an unused space can be delegated for planting trees, which provide health benefits to the community.

PDSs also revealed how participants view their role in contributing to a solution. Participants discussed how they can take action to help reform attitudes and beliefs regarding domestic hygiene and contribute to changing household dynamics regarding sanitation and hygiene-related behaviours in private space: '*We are grownups, we are fourteen now. We can do the work; it is not very tough. So, we can do that work, we can help the parents to do this work … We can clean it*' (female participant).

In another PDS that focused on food hygiene one participant shared: '*We want to wash the vegetables and we can help our mother or our grandparents or our relatives who [are] preparing food at that time*' (male participant).

Both groups acknowledge a shift in responsibility from parents to adolescents and describe personal ownership to make a change.

Discussion

To the best of our knowledge, this is the first photovoice study that explores perceptions of the cultural and contextual factors that influence sanitation and hygiene-related behaviours conducted among adolescents in India. Findings reveal that sanitation and hygiene-related behaviours are often influenced by determinants such as education, culture, gender, and other dimensions of everyday life. Furthermore, these determinants shape norms, attitudes, and beliefs that govern behaviour.

Norms influence behaviour according to several behavioural change theories. As previously revealed by PDSs, littering was described as an important, yet complex challenge in the community. Participants discussed how the accumulation of litter may lead to environmental contamination and increase risk of other health hazards (e.g. promote areas that are hospitable for flies, monkeys, mosquitos, rats, and snakes) that cause poor health outcomes (Anderson, 1964; Schultz et al., 2013).

In low- and middle-income countries such as India, inadequate sanitation infrastructure can contribute to the influx of litter, waste, and environmental contaminants into the public space and local drinking water resources (Narain, 2012; Williams et al., 2019). In this study, participants described littering as a descriptive norm (what one perceives is commonly performed), which generated poor sanitation and hygiene habits. According to the theory of planned behaviour, this finding shows how infrastructure or perceptions of control (Ajzen, 1985) have a complex relationship with sanitation and hygiene-related behaviours. Similarly, other research has discussed the relationship between sanitation and hygiene-related behaviours and infrastructure. For example, in Kenya, other infrastructure-related factors, such as having water inside versus outside the

home, influenced handwashing behaviours (Schmidt et al., 2009), while another study in India highlighted the complex relationship between toilet ownership and use (Coffey et al., 2014).

Participants also reflected upon how littering behaviours could be reinforced and maintained by attitudinal indifference. Littering was made to seem more socially acceptable, through the displacement of civic responsibilities. Participants described how they observed individuals modelling negative behaviours (e.g. littering) without consequence; therefore, encouraging others to adopt such behaviour. Various studies on littering behaviours have shown that the presence (or absence) of litter can help locate behaviours to specific spaces (Krauss et al., 1978 ; Cialdini et al., 1990; Liu and Sibley, 2004). Individuals are more likely to litter in previously littered environments because the mere presence of litter indicates that such behaviour is commonly practised in that space (Krauss et al., 1978; Cialdini et al., 1990). These descriptive norms influence attitude–behaviour relationships (Cialdini et al., 1990; Liu and Sibley, 2004), which is consistent with the perceptions of behaviours discussed in PDSs.

It is also important to reflect upon context and beliefs when assessing and understanding behaviour. When one engages in a perceived harmful behaviour such as littering, contextual factors (e.g. culture and religion) can influence one's beliefs, justification, and choice. The findings of the study revealed that cultural and religious practices incentivize specific domestic hygiene-related behaviours. Here, we link sanitation and hygiene-related behaviours to existential, spiritual, or religious beliefs. In India, notions of purity, filth, cleanliness, and hygiene are uniquely complex because of cultural taboos and beliefs (Gupta et al., 2016; Doron and Jeffrey, 2018). Participants discussed how specific sanitation and hygiene-related behaviours were motivated and maintained by spiritual beliefs, unlike cultural taboos that perpetuate an idea of the practice of cleaning as degrading work (Doron and Jeffrey, 2018). However, it was not discussed if cleaning included ritually impure spaces such as toilets. According to participants, emphasizing ties of cleanliness and religion could be an effective way of transferring domestic hygiene behaviours to public space.

Despite religious traditions, participants also revealed that throughout the community, individuals experience multiple demands making it difficult for them to engage in sanitation and hygiene-related behaviours within and outside the home. In their communities, career ambitions were not necessarily congruent with traditional household duties. These demands may have shifted in recent years, as a result of several factors, such as an increase in more industrious, stressful, and time-consuming jobs. Despite an overall decline in the female workforce in India, participation has been increasing among specific groups such as women with education (Mehrotra and Parida, 2017). This largely affects the household, since historically, women in India were responsible for household chores (Singh and Mukherjee, 2018). Therefore, the shift in societal gender norms has permeated into household dynamics and domestic hygiene behaviours. Perspectives that emerged in PDSs reveal how the cultural and contextual dimensions of sanitation and hygiene are shifting, and gender norms are a major factor.

Local knowledge is often community-based, implying that the family or elders are instrumental in knowledge transfer. It is unique to a particular culture and often informs behaviours pertaining to health and the environment (Ellen and Harris, 1997). Participants discussed local knowledge and beliefs regarding traditional medicinal remedies, handwashing behaviours, the perceived use and efficacy of chlorine tablets, domestic hygiene practices, and littering. Participants shared how knowledge and beliefs were often passed down through generations. Other studies confirm that influential attitudes and beliefs can be transferred intergenerationally. For example, in one study about personal hygiene practices in Indonesia, women reported that information about nail cutting was passed down generationally (Usfar et al., 2010). Other research regarding intestinal worms in Bangladesh suggests that health-related misconceptions were passed through elders or relatives (Bath et al., 2010). Finally, research regarding pro-environmental practices of adolescents reported that parents are key influencers of behaviours (Collado et al., 2019).

Moreover, participants recommended initiatives that address school-based education, media advocacy, policy, and infrastructure. These strategies are also consistent with existing interventions that address sanitation and hygiene-related challenges. According to participants, knowledge influenced people's ability to perform a health behaviour and their perception of associated risk. Despite these norms or habits, participants described motivation to improve the environment through modelling and policy. Hence, research findings suggest that future activities probe change on the interpersonal, community, and society levels. For example, participants suggested enforcing economic/judiciary penalties for littering. Similarly, in Nigeria, the government has taken steps to influence attitudes towards environmental sanitation, through the implementation of a sanitation court, where those who are accused of engaging in environmental pollution (e.g. water, air, and littering) are prosecuted (Pandve, 2008).

Strengths and limitations

There are several strengths and limitations in this study that must be acknowledged. Strengths included a participant and researcher relationship that fostered knowledge-sharing and meaningful participant engagement throughout the study. Participants also acted as co-investigators, as they developed research questions through photo assignments, provided data, and analysed and coded transcripts, thus generating new knowledge, which improved the quality and validity of the research. Additionally, this helped us to gain a better understanding of which issues participants deem important.

Another strength involved the application of the photovoice method which helped us to incorporate contextual elements and health challenges that were meaningful to participants in the future intervention adaptation and design. For example, we learned that waste and waste disposal behaviours (e.g. littering) were major concerns of participants. However, it would be remiss to neglect to mention how participants discussed other sanitation and hygiene-related behaviours such as handwashing, food hygiene, and toilet use. Nonetheless discussions

overwhelmingly focused on waste management, therefore the data presented in this manuscript reflects those findings. This may also be influenced by a local initiative at the school, Green Sakthi, which aims to deepen students' relationship with nature through weekly activities such as planting trees and picking up litter in the schoolyard. However, this was not probed explicitly; therefore, it is not possible to determine the extent of this influence.

The SHOWED method's final question (What can we Do?) helped participants to reflect on potential action steps. The action steps discussed included art-based activism (e.g. drama) and media advocacy. Future research concerning a large-scale evaluation of intervention activities proposed could demonstrate such strategies' effectiveness and youths' role in cultivating change within their community. In the context of this study, the action component resulted in participants creating a photo exhibition that showcased their work to their peers and the greater community. In addition, participants were motivated to include a more culturally relevant approach; therefore, they wrote and acted in a theatrical drama to promote awareness about key issues reflected upon in PDSs. Additionally, findings from this study were used to adapt Project SHINE's curriculum and programmatic activities, which were subsequently implemented in their school.

Reflexivity is a fundamental component of knowledge generation in CBPR projects such as photovoice (Suffla et al., 2015). The research team utilized reflexivity to increase research study rigour, particularly in data collection and analysis. Data were primarily collected and analysed by AGW, a female, public health academic researcher who had previous experience using the photovoice methodology and spent several months in the community. However, further reflexive exploration suggests that the position of academic researchers or outsiders in this study may have shaped participants' willingness to discuss openly and critically reflect upon personal experiences especially regarding open defecation and menstrual hygiene management (MHM).

Participants did not explicitly discuss open defecation or MHM throughout the PDSs. This is a limitation because open defecation and MHM are major public health concerns and the central focus of the national Swachh Bharat Mission. Although the research team tried to foster a supportive environment for PDS, given the visual nature of photovoice, it is possible that youth participants felt uncomfortable taking photographs related to MHM and open defecation (both sensitive topics that may be perceived as disgusting or inappropriate to discuss in a school setting) and discussing with peers in a group setting. Therefore, in this instance, the photovoice method did not permit further exploration of these topics.

However, we cannot determine reasons for the omission of open defecation and MHM without further research devoted solely to the topic. Therefore, the research team made an effort to follow up on MHM in another study which employed individual qualitative interviews to encourage narrative accounts of adolescent girls' personal experiences with menarche and menstruation in this context and will be published elsewhere. We also recommend further research regarding open defecation in this context using alternative methods such as open defection

mapping. However, it is worthwhile to note that given this was a CBPR study, we were focused on participant-identified priorities and needs to learn more about their realities and associated health challenges.

The study had other limitations, such as potential sampling bias, since the majority were female participants (seven girls versus three boys). In addition, the study took place in a private English-medium school, although many of the students are the first generation to attend school in their family. However, we would like to emphasize that results are not intended to be generalizable to other contexts and this formative work was intended to inform an adaptation of Project SHINE for implementation at the study participants' school.

Furthermore, PDSs were conducted in English, which is the primary language of instruction at the school; however, it is not the native language of participants. This may have influenced communication and analysis of data. Therefore, a translator helped facilitate the initial information meeting and we conducted member-check sessions to enhance our understanding and fill gaps by discussing preliminary interpretations and asking follow-up questions.

Conclusion

In summary, this photovoice study engaged participants and researchers in a formative research process that generated youth perspectives, explored determinants, the contextual setting, and various mechanisms of sanitation and hygiene-related behaviours. This fostered an understanding of these cultural and contextual factors to increase cultural appropriateness for the adaptation, translation, and development of health promotion strategies within the SHINE India intervention and exemplified how formative research processes using a CBPR approach can be utilized for intervention adaptation in health promotion research.

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