



Master of Disaster Management

Master's thesis 2021

Reusable menstrual supplies in humanitarian settings: A systematic review of opportunities and challenges

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Submitted: December 7, 2021



Abstract

Managing menstruation with dignity is challenging in the best of times, and even more complicated in times of crisis. While the past decade has brought attention to ending the silence and addressing gaps in menstrual hygiene/health management (MHM) in humanitarian settings, stigma, taboos, and limited evidence continue to inhibit advancements. A crucial aspect in meeting the needs of menstruators is the provision of supplies to capture and contain blood, but lack of awareness persists of the impact (social, economic, and environmental) of single-use, disposable absorbent menstrual pads in humanitarian settings. A comprehensive understanding of the human rights issues surrounding the provision of reusable menstrual supplies in humanitarian settings is also lacking. This structured systematic review identifies published MHM research in humanitarian settings (n=16) with the following objectives: analyzing, through the lens of the AAAQ (availability, accessibility, acceptability, and quality) human rights framework, the opportunities and challenges to the provision of reusable menstrual supplies in a variety of settings; and examining and discussing suggested strategies for the provision of reusable menstrual supplies. Results indicate that despite a growing dialogue around MHM in humanitarian settings, a significant need remains for increased awareness of the impact of the provision of disposable single-use pads, clarity regarding the necessary factors for the provision of reusable menstrual supplies, and comprehensive guidance for implementing programs that offer reusable supplies. It is only through shifting the focus from the provision of single-use disposable menstrual products that the humanitarian sector will enable menstruators to manage their menstruation with increased confidence and dignity, while providing supplies that are less harmful socially, economically, and environmentally.

Acknowledgements

This work builds “off the shoulders of many giants who have come before me”-I.Newton. I am grateful for all those who have served as MHM humanitarian staff and for the efforts of Marni Sommer and Margaret Schmitt and their Columbia University Mailman School of Public Health team as well as Julie Hennegan, Marianne Tellier, and Siri Tellier.

Dedication

To: Natasha Rogen and Malene Skov Stolborg, the most thoughtful, kind, dedicated writing peers; my supervisor Peter Kjær; and my family who have all inspired and encouraged me to think more deeply about the important issue of menstrual dignity in humanitarian settings.

Statement of authorship

I hereby declare that I am the sole author of this master's thesis and that I have not used any sources other than those identified as references. I further declare that I have not submitted this thesis at any other institution to obtain a degree, do not have any competing interests, and did not receive any financial support for this review.

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List of abbreviations and definitions

This systematic review utilizes the following abbreviations and definitions:

AAAQ	Availability, accessibility, acceptability, quality
DIHR	Danish Institute for Human Rights
ESCR	Economic, social, and cultural rights
HRBA	Human rights based approach
IFRC	International Federation of Red Cross and Red Crescent Societies
JMP	Joint Monitoring Programme for Water Supply, Sanitation and Hygiene
MH	Menstrual health
MHM	Menstrual hygiene/health management
NFI	Non-food item
SDG	Sustainable Development Goals
WASH	Water, sanitation, and hygiene

Disaster is a serious disruption of the functioning of a community or a society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources (UN Office for Disaster Reduction, 2009). Disasters are also called ‘natural disaster’, humanitarian setting/crisis, or complex emergency. Disasters in this research include both short term crisis situations such as natural hazards as well as long term protracted settings such as displacement into refugee camps.

Humanitarian field staff are persons involved in or connected with improving peoples’ lives and reducing suffering. In this research, field staff serve on the ground in disaster settings (*Cambridge Dictionary: Humanitarian Definition*, 2021)

Humanitarian setting, a location where support is offered when an affected society is unable to meet the basic needs of the affected population, using its own resources, with the shock or stress of a disaster. Humanitarian aid is often provided to vulnerable communities that lack resources, preparedness, or both (Anderson & Gerber, 2018)

Menstruator, anyone who experiences a menstrual cycle, regardless of gender identify, can be identified as a person who menstruates. A menstruator may identify as trans, non-binary, male, or another identity. Not all girls and women menstruate and not all menstruators identify as girls or women (M. Tellier et al., 2020).

Menstrual health (MH), a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity, in relation to the menstrual cycle (Hennegan, J., Winkler, I.T., Bobel, C., Keiser, D., Hampton, J., Larsson, G., Chandra-Mouli, V., Plesons, M., & Mahon, 2021) (Appendix A). Menstrual health includes not only menstrual hygiene and the management of menstruation, but also related issues such as pain, stigma and taboo, gender, understanding of the menstrual cycle and overall well-being. MH also more broadly frames the issue as a right to dignified menstruation (Wilson et al., 2021)

Menstrual hygiene management (MHM) describes the needs experienced by people who menstruate. Effective MHM response contains three essential components. 1. Access to sanitary items, materials, and products referred to as menstrual supplies throughout this paper. 2. Private, safe, and appropriate facilities for washing, drying, bathing, and blood and menstrual supply disposal. 3. Knowledge and information about menstruation, cultural taboos, health issues, supplies use and disposal. (Sommer, Schmitt, et al., 2017)

Menstrual supplies, materials or products used to capture and contain vaginal blood and support supplies used to hold such materials in place (e.g., underwear or strap), also referred to in the retrieved research as sanitary or hygiene pads/napkins/products, menstrual pad/belt/strap, absorbent period product, disposable single-use/reusable/washable pad, menstrual cup, menstrual/period panties/underwear. The author prefers not to use the term sanitary products because of sanitation's association with the prevention of the spread of pathogens and the management of human waste and the author prefers not to use the term hygiene as it is associated with personal cleanliness and menstrual blood is neither unclean nor dirty.

Provision, the action of providing something for use. In this research, provisions include the allocation of menstrual supplies such as cloth, pads, menstrual cups, and menstrual underwear in humanitarian settings.

Reusable menstrual supplies include materials and products that can be washed or cleaned and reused to collect and contain menstrual blood. Supplies such as cloth, washable pads, menstrual cups, and menstrual underwear are the most common reusable menstrual supplies referenced in this research.

Sustainable, according to the United Nations, sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs and includes three pillars-economic, social, and environmental (United Nations, 2021). Some research refers to reusable menstrual products such as washable or biodegradable pads, menstrual cups, and menstrual underwear as 'sustainable' because they are understood to be less harmful for the environment than single-use disposable pads.

Introduction

Menstruation is a natural, biological process experienced by 1.8 billion girls, women, and other menstruators of reproductive age, including those who identify as non-binary, transgender, male or another identity (UNICEF, 2019). Each day, over 300 million people are menstruating (Amaya et al., 2020). Menstrual bleeding lasts between 2-7 days each month, between menarche, the first cycle, and menopause, when the body no longer menstruates, aside from during pregnancy, exclusive breastfeeding, or hormonal disruptions due to factors such as stress or malnutrition, equating to approximately 450 monthly cycles over 35 years for the average menstruator

(WaterAid India, 2019). The ability to manage one's menstrual health is linked to increased confidence, comfort, mobility, independence and safety, and decreased fear of embarrassment and distraction about menstrual needs (House et al., 2012; IFRC, 2019; UNICEF, 2019). Yet, the experience of menstrual monthly vaginal bleeding is fraught with silence, taboo, stigma, social isolation and stress for many menstruators, leading menstruators to face significant social, physical and economic challenges managing their menstrual health with adequate knowledge, safety, comfort and dignity (McLaren & Padhee, 2021; Sommer, Phillips-Howard, et al., 2017).

The ability to effectively manage one's menstrual health, menstrual hygiene management (MHM), is defined by Sommer, Schmitt, et al. at Columbia University Mailman School of Public Health as including the following three components: access to menstrual supplies to capture and contain the blood and supportive materials to use the supplies; access to facilities for washing, drying and disposing of menstrual supplies; and health promotion and education regarding menstruation as well as information to address harmful cultural and social norms linked to menstruation (Sommer, Schmitt, et al., 2017). Successfully managing the physical, social, and cultural aspects of menstrual hygiene helps menstruators engage in daily activities and live with dignity (House et al., 2012).



Figure 1- Three Essential Components of a Complete MHM Humanitarian Response. Source: A Toolkit for Integrating Menstrual Hygiene Management (MHM) into Humanitarian Responses: The Full Guide (Sommer, Schmitt, et al., 2017)

It is well established that girls and women are disproportionately vulnerable and affected in disasters due to cultural norms and inequitable distribution of resources and power (IFRC, 2020). During disasters, such as those related to natural hazards and during complex protracted crisis like conflict and displacement, when the coping ability of the affected community or society exceeds its resources, the challenge of managing menstruation is often exacerbated (IFRC, 2019). Menstruators may face disruptions to housing, food, and livelihoods, loss of possessions, routines, and materials to contain blood, and lack of access to water and/or safe, private facilities to change, clean, wash and dry menstrual materials (UNICEF, 2018). Menstruators may be dependent on the humanitarian sector for supplies and information about menstrual health as education and health promotion channels are often disrupted (Schmitt et al., 2017; Sommer, 2012). In addition, many disaster settings lack appropriate waste disposal systems for adequately managing used menstrual waste, increasing a menstruator's difficulty in managing menses (House et al., 2012).

Grey literature from Plan International and the World Bank during the COVID-19 pandemic exposes challenges for menstruators including accessing supplies due to production and supply chain disruptions as well as restrictions to physical movement during lockdowns, quarantine, and isolation (Plan International, 2020). Additionally, the impact is reflected in loss of livelihoods and increasing challenges affording menstrual supplies (The World Bank, 2020). Lack of ability to properly manage menstruation can result in period poverty or period insecurity, not being able to afford supplies or access to supportive facilities, shame, and embarrassment (M. Tellier et al., 2020). An inability to adequately manage menstruation may even contribute to missed school or work as menstruators who do not have access to supplies are not able to manage the discomfort of menstruation and/or to collect and contain blood, leaving them afraid that discomfort or a menstrual leak will create shame and embarrassment (House et al., 2012; WHO & UNICEF, 2019).

In a disaster situation, an immediate need for menstruators is to capture menstrual blood so the individual may continue activities such as, and depending on the severity of the setting, accessing water and preparing food, caring for dependents, attending school and work, and aiding in relief efforts, without having to worry about the shame of leaking, odor, or staining (Sommer et al.,

2015). When MHM is provided, generally the first line of action is to provide menstrual supplies, followed by supportive facilities and information (VanLeeuwen & Torondel, 2018b). An arguably convenient solution in humanitarian settings where MHM is provided has been the distribution of absorbent material pads and/or cloth to support menstruators in containing the 2-6 tablespoons of blood released during a monthly cycle (Sommer, Schmitt, et al., 2017). While many types of menstrual supplies could be provisioned in humanitarian settings, the allocation of single-use disposable menstrual pads has served as a reliable way for humanitarian organizations to help menstruators manage bleeding, and is especially advantageous in settings with a scarcity of safe water and privacy as disposable pads do not require additional water or soap for cleaning pads or a discrete place to thoroughly dry pads (Naegeli, 2020).

But, disposable pads have drawbacks. The quantity of single-use pads needed in a major disaster is significant. For example, research from Chaudhary et al. and Tellier et al. noted that 750,000 disposable pads per day would have needed to be produced, distributed and financed to support the 1.4 million estimated menstruators affected by the 2015 Nepal earthquake with the Sphere Handbook recommended 15 disposable pads per recipient/per month (Chaudhary et al., 2017; M. Tellier et al., 2020). In addition, the waste produced from disposable pads can create challenges. The housing of menstrual hygiene management within the water, sanitation and hygiene promotion sector (WASH) is said to link to the frustration experienced by WASH sector engineers when pit latrines filled prematurely with discarded single-use menstrual products, as disposable pads, designed as super-absorbents, meant to soak up liquid and expand, quickly fill latrine pits (House et al., 2012). Plastic products and packaging can also clog toilet pipes when improperly disposed, like flushed down a toilet (Elledge et al., 2018; Roeckel et al., 2019). Furthermore, in humanitarian settings, existing solid waste management options for disposable pads may be inadequate as many settings lack safe waste management systems (Schmitt, M.L., Clatworthy, D., Gruer, C., Sommer, 2020). The safe management of menstrual waste, in general, is said, to be 'lagging far behind' the growing disposable menstrual product market (WaterAid, 2017). In humanitarian settings, this lag creates even greater challenges (Shackelford et al., 2020).

In many parts of the world, for those who can afford them, disposable menstrual pads have become the norm (Lopez, 2021), but single-use disposable pads are often not the pre-crisis norm, or even the preferred method for menstruators in low income humanitarian settings (Van Eijk et al., 2021). Safe and hygienic traditional methods of capturing menstrual blood include absorbent materials which can be washed, dried and reused, such as clean cloth or wool (S. Tellier & Hyttel, 2017). When menstruators do not have access to safe and hygienic methods, they may resort to using available materials to capture blood such as newspaper, foam, and even discarded jute collected in the corners of Bangladesh textile industry sewing rooms and used by employees, as noted in *Period. End of Sentence* by author A. Diamant (Diamant, 2021). These materials may be uncomfortable and even harmful, causing irritation and infection and may potentially link to reproductive issues (Diamant, 2021; VanLeeuwen & Torondel, 2018b).

The humanitarian sector could provide a variety of hygienic methods to help menstruators manage their cycles including cloth, single use disposable pads, washable menstrual pads, tampons, menstrual cups or menstrual underwear (Amaya et al., 2020). Most of these products are readily available in high and middle income countries where humanitarian organizations are based, but many 'innovative' products such as menstrual cups, period underwear and even biodegradable pads have not reached mainstream market access and acceptability in low and middle income countries where the humanitarian sector serves the most vulnerable (Smith et al., 2020; Sommer et al., 2020). Thus, menstruators may lack exposure to and knowledge about these products and may need additional information about the product and proper use in order to consider using these supplies (Sommer, 2012). In addition, the products may not be accessible in the local community after the humanitarian effort subsides.

Since 2012, conversations about menstrual health management (MHM) in disaster settings and initiatives to address menstruators' needs have increased significantly (Krishnan & Twigg, 2016; Sommer, 2012; Sommer, Schmitt, et al., 2017; VanLeeuwen & Torondel, 2018b). Advancements include: the 2017 release of "A Toolkit for Integrating Menstrual Hygiene Management (MHM) into Humanitarian Responses" (Sommer, Schmitt, et al., 2017), an extensive toolkit for rapid integration of MHM across sectors and phases in the emergency contexts; the updated 2018

Sphere Handbook including standard 1.3 Menstrual hygiene management and incontinence which includes absorbent product recommendations and requests for ‘attention to the preference of girls and women’ (Sphere, 2018); and IFRC’s 2019 Addressing Menstrual Hygiene Management (MHM) Needs Guide and Tools (IFRC, 2019). All guides, suggests culturally appropriate supplies and recommend consultation, whenever feasible, with menstruators to ensure appropriate menstrual supplies (pads or cloth and supportive materials), recommend menstrual friendly supportive facilities, menstrual health education, and efforts to address stigma and taboos. While none of the current guidelines specify quality standards or specifically advise the humanitarian sector to choose reusables, reusables are presented as an option.

In addition, a rights based approach as well as the development of the 2030 Sustainable Development Goals (SDGs) has brought voice to the ‘silenced’ subject of menstruation and increased awareness that society’s response to menstruation and a menstruator’s ability to adequately manage their menses is linked to human rights and gender equity (Human Right Watch & Wash United, 2017). MHM has been recognized as an influential tool in supporting reaching the SDGs as well as an inhibitor to achievement when MHM is not realized. In fact, a recent article by Sommer et. al describes the importance of addressing MHM to enable progress across the SDGs and highlights the connection of menstruation to every SGD including the obvious such as SDG3 (physical health and psycho-social well-being for women and girls), SDG4 (quality education), SDG5 (gender empowerment and equality), SDG6 (water and sanitation), SDG8 (decent work and economic growth), and SDG12 (responsible consumption and production for the environment) (Sommer et al., 2021).

While awareness of MHM in disaster settings has increased, the primary focus appears to remain the availability and affordability of absorbent menstrual supplies, with a secondary focus on the additional essential MHM components such as washing or changing facilities and reducing cultural norms and practices that discriminate against and oppress menstruators (VanLeeuwen & Torondel, 2018b). Extensive research by Schmitt et al., UNICEF, WaterAid and others recommends menstrual friendly facilities which include gender specific toilets, adequate lighting, locks on toilets, a mirror for checking for blood stains, and private stalls. While components may be not

realistic in all settings, a minimum of access to menstrual supplies and clean, safe space to change and wash allows better menses management (Schmitt et al., 2018; UNICEF et al., 2018).

While much focus in MHM remains on the provision of menstrual supplies, an under researched area is menstrual waste. Very little attention is given to addressing the waste produced from MHM (Sommer et al., 2016), the need for safe disposal, or the ecological impact of disposable products (Hennegan et al., 2017). A 2018 literature review by Elledge regarding MHM and waste disposal in low and middle income countries emphasizes that disposal of menstrual waste is often neglected in MHM, leading to improper disposal and negative impacts on users, the sanitation systems, and the environment (Elledge et al., 2018; Sommer et al., 2020). Furthermore, informal conversations (email and telephone correspondence) between the author and leading MHM researchers (Sommer and Schmitt-email series June 3-July1, 2021, M. Tellier-telephone April 28-May 5, 2021 and S. Tellier-telephone and email May 13-September 13, 2021) identified menstrual waste management as a significant research gap in humanitarian settings. In addition, the release of “Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs” from the WHO and UNICEF JMP acknowledgment that greater research and consideration of the impacts of disposable products on the environment is needed (JMP, 2021) prompted the author to reflect on the impact provision of disposable products from the humanitarian sector.

Waste from disposable pads can be ‘properly’ disposed of in two ways, landfills where disposable pads take hundreds of years to decompose because most disposable menstrual pads are made from 90% plastic with cellulose, super absorbent polymers, plastic covering, and adhesives/glue (Viner et al., 2012) or incineration (in the open or in incinerators) but burning can release fumes that are harmful for health like dioxins and furans, known carcinogenic compounds from the synthetic/plastic layers (Elledge et al., 2018; WaterAid India, 2019). Low-quality incinerators are more likely to produce harmful emissions, therefore, the Sphere Handbook recommends that pits and incinerators be built to national and international standards and operated, maintained and decommissioned safely (Sphere, 2018) but national and international standards must exist and be enforced to protect community members from harmful fumes (Elledge et al., 2018).

When proper disposal is not available or accessible, menstruators often use methods such as burning and burying. Informal burial or burning can directly and indirectly harm menstruators as they may inhale fumes while managing the burn or may put themselves at risk of violence or harm seeking private, available land to burn or bury the pads (Schmitt et al., 2017). In addition, menstruators may use valuable resources for pad disposal. For example, in a South Africa setting with limited water, research from Schmitt et al. noted menstruators washing blood from pads before burial to reduce the possibility of animals, including dogs, unearthing the pads (Schmitt et al., 2021). When used pads are discarded into bodies of water such as streams or rivers, chemicals can leach into the water or food chain. Even proper disposal may put others at risk when latrines are emptied manually by persons who do not have proper personal protection equipment (IFRC, 2019). In addition, anecdotal evidence from WaterAid India suggests that when girls lack disposal facilities, they may use pads for a longer duration than recommended resulting in discomfort and potential health risks (Haver & Long, 2015; WaterAid India, 2019).

When considering the environmental impact of disposable menstrual products like single-use pads and tampons, it is important to note the resources and energy used to produce and distribute the products, including the chemical emissions released processing raw material and those used for dyeing the absorbents white, and the plastics in pads and applicators which are made of low-density polyethylene, requiring energy-intensive processing (Elledge et al., 2018). Reusable cotton pads also require production, and cotton's production toll on the environment including water, fertilizers and genetically modified seeds should not be overlooked, but the ecological impact and product lifespan may be more justifiable considering the 4–6-hour single usage-cycle for disposable products, compared to the 3-5 years of potential use provided by washable cloth pads and 10 years for a menstrual cup. That said, washable products do produce some amount of waste throughout their lifespan because washing requires water (15 liters for washable pads per month and 1 liter for menstrual cups) and soap (a potential pollutant) and eventually the product needs to be replaced (M. Tellier et al., 2020).

While much of the current research on MHM and waste disposal in low and middle income countries, identified by the Elledge et al. literature review, and Schmitt et al. is focused on

innovative waste stream management and local solutions for incineration, immersing research by Lopez argues that it is time to consider the long-term environmental impact of short-term solutions that contribute to the production, provision, and preference of products, in particular, single-use disposable pads, that produce menstrual waste (Elledge et al., 2018; Lopez, 2021; Schmitt, M.L., Clatworthy, D., Gruer, C., Sommer, 2020; Schmitt et al., 2021). Yet, the opposite seems to be occurring in humanitarian settings, including a push towards both the provision of disposable pads as the gold standard, according, “Monitoring menstrual material across 10 countries” research by Smith et al., and encouragement of the local production of disposable pads (Smith et al., 2020).

The use of disposable pads in humanitarian settings may be a reflection of larger trends including government support of disposable pads (e.g. India’s National Menstrual Hygiene Scheme and Scotland’s provision of tampons and disposable pads under the Period Products ((Free Provision)) Scotland Act 2021) (Smith et al., 2020) and the mainstreaming and even glorification of local production of disposable pads (Amaya et al., 2020; Sommer et al., 2020) including award winning 2018 feature film “Pad Man” praising the story of entrepreneur Arunachalam Muruganantham’s creation of low-cost pad-manufacturing machines to provide rural women both jobs and pads. The 2019, Academy Award winning Best Documentary (short subject) film, “Period. End of Sentence,” and the book that followed are also about the local production of single-use disposable pads (Amaya et al., 2020; Diamant, 2021).

While the humanitarian sector may be increasing the creation of waste through the provision of disposable single-use pads, eventually the lack of planning for adequate disposal and a lack of acknowledgment of the ecological impact will need to be addressed (Lopez, 2021; UNICEF, 2019). The optimal strategy to waste management is the prevention of the generation of waste and hence the prevention of the necessity for disposal. The Waste Hierarchy/Pyramid, adapted by the author from Tellier and Roche’s Good Waste Management Hierarchy from “Public Health in Humanitarian Action open educational resource”, offers a strategy to reduce the creation of solid menstrual waste (S. Tellier & Roche, 2016) through the provision of reusable menstrual supplies.



Figure 2- Menstrual Supplies Waste Pyramid. Source: Adapted by the author from “Public Health in Humanitarian Action”, originally sourced from Morris-Iveson, Golder Associates (S. Tellier & Roche, 2016)

One strategy for menstrual waste reduction, reflected in the Menstrual Waste Pyramid, is to decrease the creation of solid waste in humanitarian settings by offering, supporting, and enabling the provision of reusable menstrual supplies such as washable products that capture and contain blood while minimizing the necessity of an extensive menstrual waste management system and minimizing menstrual product waste ecological harm.

When humanitarians begin to shift focus from single-use disposable pads to less ecologically harmful menstrual supply solutions, research will be needed to more clearly understand the opportunities and challenges in the provision of reusable menstrual supplies. This review systematically collates, summarizes, and analyzes available peer-reviewed published literature for consideration and consensus in perceptions of the opportunities and challenges in the provision of reusable menstrual health supplies in a variety of disaster settings with the goal of shedding light on the answers to the following question:

What are the opportunities and challenges to the provision of reusable menstrual supplies in humanitarian settings?

Main Objective

To examine, through a systematic review of menstrual hygiene management (MHM) in humanitarian settings, the opportunities and challenges in the provision of reusable menstrual supplies in humanitarian settings.

Objectives

- **Analyze**, through the lens of the AAAQ (availability, accessibility, acceptability, and quality) human rights framework the opportunities and challenges to the provision of reusable menstrual supplies in a variety of humanitarian settings
- **Examine** and **discuss** suggested strategies for the provision of reusable menstrual supplies in humanitarian settings

Methodology

This systematic review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) including the use of the 27-item checklist guidelines to improve transparency (Appendix B).

After initial literature searches yielded too few published articles focusing specifically on MHM in humanitarian settings that utilized the provision of reusable menstrual supplies, the structured search strategy was expanded to identify all published research about MHM in humanitarian settings so that the opportunities and challenges in the provision of reusable menstrual supplies could be extracted from a broader scope.

Based on guidance from information specialists in the University of Copenhagen Science Libraries KUB Frederiksberg and KUB Nord and the results of a series of test searches in various databases, the systematic review was conducted on October 5, 2021, using three databases: PubMed, Scopus, and Web of Science. Initial searches on Google Scholar were utilized in the beginning of the research process, from April through September 2021, to build a knowledge foundation for the author and to provide support for the introduction and discussion sections.

Research from the systematic review was culled through the three databases using a consistent keyword collection process.

Key terms and words used in **PubMed**, **Scopus** and **Web of Science**:

Table 1- Key terms and words used in systematic review

"menstrual hygiene management" OR	AND disaster*
"menstrual health management" OR	OR emergenc*
"menstrual practices" OR	OR humanitarian
"menstrual health and hygiene" OR	OR refugee
	OR earthquake
	OR flood

It is important to note that while disasters can be triggered by natural forces and human-made events and may include sudden, acute events as well as slow-onset events with long-term impacts. In this research, in addition to disaster*, emergenc* and humanitarian, earthquakes and floods were singled out as key words because floods are the most common natural hazard and often result in significant population displacement while earthquakes cause the most deaths and injuries, according to the IFRC "Come Heat or High Water World Disasters Report, 2020" and research from in *Introduction to Humanitarian Emergencies* (Anderson & Gerber, 2018; IFRC, 2020). In addition, research following the Nepal earthquake forms the foundation for much of the existing published MHM research from humanitarian settings (Budhathoki et al., 2018).

Duplicates were removed, and abstracts were screened for all remaining articles. The following inclusion and exclusion criteria were respected before the remaining full text articles were retrieved and downloaded into Mendeley as a resource to manage and organize the research:

Table 2-Inclusion and exclusion criteria used in systematic review

Inclusion	Exclusion
Restricted to humanitarian settings	Not focused on humanitarian settings
Restricted to English language	Not focused on MHM
Restricted to published research	Does not include information about the provision of MHM supplies in humanitarian settings
All dates, no date restriction	Clinical, lacking a public health or human rights perspective

The full content of each downloaded article was analyzed using thematic analysis, a qualitative data analysis method, which utilizes inductive reasoning and thematic development to identify, analyze and report themes within the research. NVivo software was used by the author to code relevant data points from each research article into defined themes and to aid in discerning connections between sources and identifying patterns in meaning across the data (NVivo, 2004).

The AAAQ Danish Human Rights framework provided the structure for the author to analyze the retrieved research in the themes of availability, accessibility, acceptability, and quality to provide a more comprehensive scope of the opportunities and challenges to the provision of reusable menstrual supplies in humanitarian settings (DIHR, 2013). The framework used for this analysis was adapted, to focus on reusable menstrual supplies, from the Danish Institute for Human Rights (DIHR) AAAQ Framework for Sexual and Reproductive Health and Rights and the DIHR AAAQ Framework for Rights to Water (Lena Kähler, Marie Villumsen, 2017; Villumsen & Jensen, 2014). Human rights based analysis approaches like AAAQ have been identified in research by Villumsen and Jensen as supportive measures in the realization of the SDGs (Villumsen & Jensen, 2014).

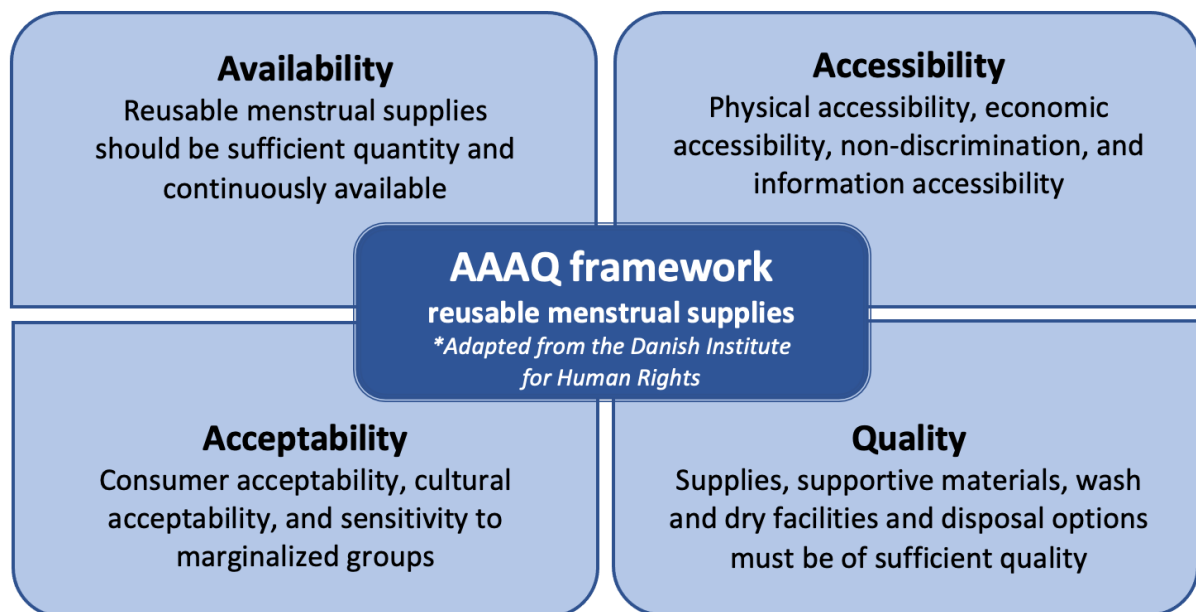


Figure 3- AAAQ Framework. Source: Adapted by the author from the Danish Institute for Human Rights (Lena Kähler, Marie Villumsen, 2017; Villumsen & Jensen, 2014)

Analysis drawn from published peer-reviewed research about the availability, accessibility, acceptability, and quality of reusable menstrual supplies in humanitarian settings was coded, summarized, and assessed so that a deeper understanding of the of the economic, social, and cultural rights of menstruators in humanitarian settings was gained.

The criteria, adapted by the author for reusable menstrual supplies, used for coding within each of the themes included:

Table 3-AAAQ NVivo coding criteria used in systematic review.

Source: adapted by author from DIHR (Lena Kähler, Marie Villumsen, 2017; Villumsen & Jensen, 2014)

Availability	Identifies what the research says about a sufficient amount of reusable menstrual products within a humanitarian setting and whether a regular supply is available over time. Viewed from a supply perspective of ensuring that enough reusable menstrual supplies are available at any given time in a specific location. Availability is an objective criterion when M&E is available measured through quantitative data (e.g. amount of reusable supplies and regularity of restocking).
Accessibility	Concerns the level of access to reusable menstrual supplies and identifies who has access. Factors such as equality and non-discrimination, participation, and accountability influence menstruators' ability to access supplies. Physical: within physical reach and accessed without social or physical threats. Economic: cost of accessing reusable menstrual products and whether the cost threatens the realization of other rights: e.g., if a menstruator is forced to prioritize between reusable menstrual products and food. Non-discrimination and inequalities: in distribution of reusable supplies to different groups in society. Information: of information on MH and reusables including participation in policy and decision-making.
Acceptability	Concerns the subjective assessments of menstruators' perceptions about reusable menstrual supplies. Consumer: characteristics of reusable supplies (e.g., comfort, fit, aesthetics, preference). Cultural: perceptions based on the culture, minority groups and communities (e.g., menstruators beliefs about activities that can be performed during menses or the potential consequences of another person seeing menstrual blood).
Quality	Concerns the quality of the reusable menstrual supplies, supportive materials, wash and dry facilities and disposal options. Is closely linked to international and national quality standards. Assessing quality is difficult without established standards.

Finally, coded (AAAQ) NVivo results were interpreted and summarized by the author.

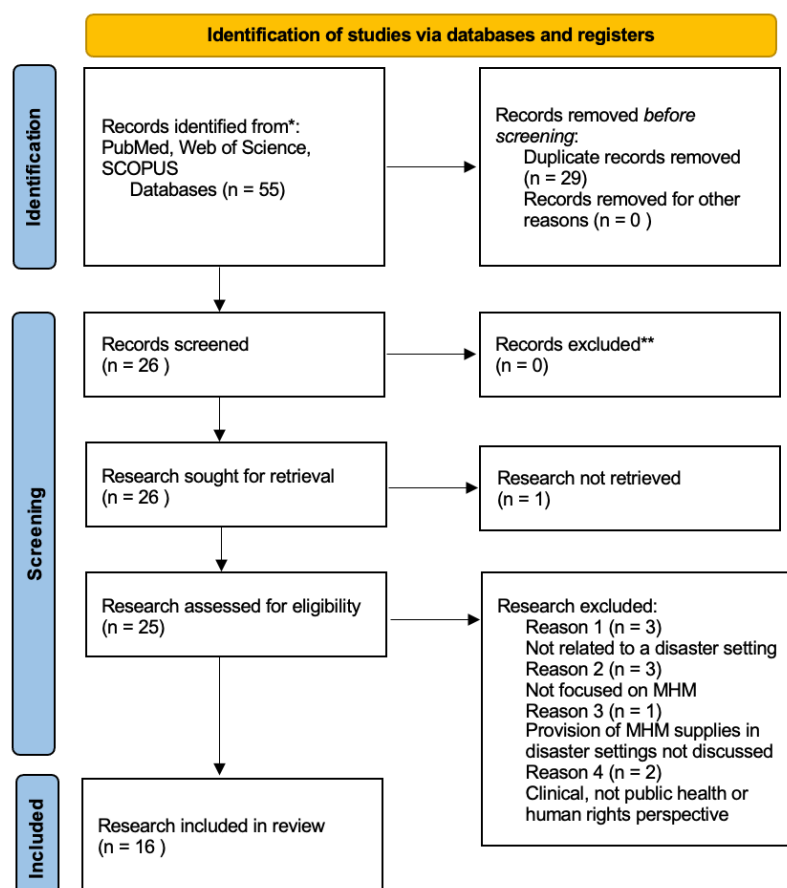
Findings/Results

PRISMA flow diagram

Retrieved articles (n=55) from the three databases were sorted and duplicate articles (n=29) were removed before screening (n=26). One article could not be retrieved in full (n=1). The remaining (n=25) were retrieved and assessed for eligibility using the inclusion and exclusion criteria. The articles remaining (n=16) were all reviewed in full and include twelve articles from original studies (n=4 qualitative, n=4 mixed method, n=2 case study, n=2 global literature reviews). The remaining articles include a book chapter (n=1) and practice notes (n=1) and recommendation articles (n=2) published in peer-reviewed journals.

Figure 4- PRISMA 2020 Flow Diagram (Page et al., 2021)

PRISMA 2020 flow diagram for new systematic reviews



From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71
For more information, visit: <http://www.prisma-statement.org/>

Table 4-Systematically retrieved articles

#	Author, Year	Title	Key Words	Publication	Important Reusable Menstrual Supply MHM Components	P M	W O S	S C O P U S
1	(Sommer, 2012)	Menstrual hygiene management in humanitarian emergencies: Gaps and recommendations	Adolescent girls; Humanitarian emergencies; Menstrual hygiene management; Women	Waterlines	Taboos prevent menstruators from washing menstrual materials in the family wash basin. Private menstrual washing and drying spaces, hidden from males, are important. An increased need for water during monthly menses may not be adequately accounted for by the humanitarian sector during droughts.			X
2	(Krishnan & Twigg, 2016)	Menstrual hygiene: A 'silent' need during disaster recovery	Community resilience; Disaster recovery inclusive wash; Menstrual hygiene management	Waterlines	MH was overlooked at the household level during recovery; Assam menstruators (considered impure and polluting household) faced seclusion, isolation, and increased privacy and security concerns post-disaster. Ad hoc approaches to HMH, limited to distribution of sanitary pads that do not address socio-cultural practices around MHM. Prefer using menstrual cloth which is cheaper and can be washed, dried, and reused (changed pads only 1x/day).			X
3	(Sommer et al., 2016)	What is the scope for addressing menstrual hygiene management in complex humanitarian emergencies? A Global review	Menstrual hygiene management, emergencies	Waterlines	Menstruators lack mechanisms for privately disposing of used materials and for discreetly washing and drying reusable menstrual materials. General lack of consensus of key MHM components including washing and drying of reusable materials and endpoint disposal systems. 'The use of various pads will only be successful if enabling environments support their actual usage.'			X
4	(Chaudhary et al., 2017)	Humanitarian response to reproductive and sexual health needs in a disaster: the Nepal Earthquake 2015 case study	Asia; Nepal; adolescent girls; disaster; earthquake; humanitarian response; reproductive health; women	Reproductive Health Matters	Case study documenting the distribution of 56.000 kits provided by the UNFPA or partner agencies containing items to maintain personal hygiene and safety. Reusable sanitary pads were listed as one part of the dignity kit description.		X	X
5	(Budhathoki et al., 2017)	Reusable sanitary towels: Promoting menstrual hygiene in post-earthquake Nepal	NA	Journal of Family Planning and Reproductive Health Care	Personal view arguing the benefits of reusable sanitary towels made from locally available materials to increase sustainable and acceptable means of managing menstrual hygiene in a crisis. Quotes a study saying 97% of women use reusable materials in low-income countries.	X	X	X
6	(Schmitt et al., 2017)	Understanding the menstrual hygiene management Challenges facing displaced girls and women: Findings from qualitative assessments in Myanmar and Lebanon	Humanitarian response; Lebanon; Menstrual hygiene management; Menstruation; Myanmar	Conflict and Health	Lack of access to water and places to wash and dry reusable pads and cloths or to dispose of used materials in many emergency contexts. Increase risk to exposure and violence seeking out private spaces to manage sanitary needs. Culture beliefs influence menstrual practices including types of materials, methods for disposing waste, and preferences for washing and drying reusables	X	X	X
7	(VanLeeuwen & Torondel, 2018a)	Exploring menstrual practices and potential acceptability of reusable menstrual underwear among a middle eastern population living in a refugee setting	Displacement; Emergency; Humanitarian emergency; Humanitarian relief; Menstrual hygiene; Menstrual underwear; Refugee	International Journal of Women's Health	Original study exploring the acceptability and utility of reusable menstrual underwear through examining the beliefs, behaviors, and practices of MHM in a Middle Eastern population living in a refugee setting. Acceptance of the concept was expressed, although the perceived benefits of the product did not outweigh customary practices. The inconvenience of having to remove clothing to change the reusable product/underwear was a significant disadvantage.	X	X	X

8	(VanLeeuwen & Torondel, 2018b)	Improving menstrual hygiene management in emergency contexts: Literature review of current perspectives	Emergency; Evidence; Guidelines; Menstrual hygiene; Public health	International Journal of Women's Health	Noted lack of empirical evidence examining the introduction and testing of new MH products (cups, underwear) in humanitarian settings. Importance of consulting with menstruators when designing interventions and ensuring washing and drying facilities if washable pads are distributed.	X	X	X
9	(Budhathoki et al., 2018)	Menstrual hygiene management among women and adolescent girls in the aftermath of the earthquake in Nepal	Menstrual hygiene; Nepal earthquake; Sexual and reproductive health; Women's health	BMC Women's Health	Reusable sanitary cloth was used by 67% of respondents before the earthquake. 43% of women and girls menstruated within the first week after the earthquake. None of the respondents reported receiving menstrual absorbents in relief materials in the first month following the earthquake. 74% felt reusable pads were a sustainable choice. 85% of those who used disposable pads disposed at a random nearby open and uninhabited space. 'Reusable perhaps a sustainable and culturally suitable alternative in the Nepalese context'.	X	X	X
10	(Giles-Hansen et al., 2019)	Experiences from East Africa and lessons in addressing the menstrual hygiene needs of women and girls	Dignity; MHM; Menstrual health; Menstrual hygiene; Menstruation; Women	Waterlines	MHM test kits (2 of 3) included reusable/washable pads. Preferences for reusable or disposable kits varied by age and changed after distribution. First time for many women seeing and using 'modern' designed washable pads (used rags or cloth prior). Older women preferred washable because more comfortable and absorbent than cloth and not require purchasing every month. Some younger adolescents felt uncomfortable washing menstrual blood from reusables and considered disposable cleaner.			X
11	(Bhattacharjee, 2019)	Menstrual Hygiene Management During Emergencies: A Study of Challenges Faced by Women and Adolescent Girls Living in Flood-prone Districts in Assam	Assam; Menstruation; WASH; floods; humanitarian response; menstrual hygiene management	Indian Journal of Gender Studies	Uneven distribution of relief with no preparation for disposal of sparsely distributed sanitary napkins. Disaster management guidelines (gender-sensitive and inclusive WASH response) have not been adopted in annual flood area. Strong taboos around food, social interactions and bathing during menstruation. 79% use cloth, 29% use commercially available pads. Menstrual cloth stored in a plastic bag in preference to drying in open. Disposal: 32% burnt, 43% buried in secluded parts, 20% weighted plastic bag in river.		X	X
12	(Kemigisha et al., 2020)	A qualitative study exploring menstruation experiences and practices among adolescent girls living in the Nakivale refugee settlement, Uganda	Adolescent; Africa; Menstruation; Migration; Refugee; Sexual and reproductive health; Uganda	International Journal of Environmental Research and Public Health	Disposable menstrual hygiene products were obtained from UNHCR, 5-6 packets of pads per woman to share with other female family members. Often the supplies are insufficient and when unavailable, menstruators used cloth and rags. Several girls reported good hygiene practices and cleaning of reusable materials, the latter were washed with soap and water and sundried.	X	X	X
13	(M. Tellier et al., 2020)	Practice Note: Menstrual Health Management in Humanitarian Settings	NA	The Palgrave Handbook of Critical Menstruation Studies	Cups are becoming increasingly popular in high income countries but also in many countries in Africa due to low cost, high comfort and sustainability. WoMena provides information on a range of menstrual supplies but solely distributes reusable materials, menstrual cups and reusable pads. Highest satisfaction found when provided both materials and menstruator could alternate for needs.	X		
14	(Schmitt et al., 2021)	Innovative strategies for providing menstruation-supportive water, sanitation and hygiene (WASH) facilities: learning from refugee camps in Cox's bazar, Bangladesh	NA	Conflict and Health	Some reusable menstrual materials have grown in popularity for distribution in emergencies as they are perceived to be more sustainable and cost effective, particularly in protracted emergency contexts. Reusables require consistent access to soap, water and private space for discreet washing and drying. To date there has been insufficient attention towards ensuring that WASH services are supportive of the use of reusable menstrual materials.	X		X

15	(Rakhshanda et al., 2021)	Knowledge and practice regarding menstrual hygiene management among the Rohingya refugee adolescent girls in Cox's Bazar, Bangladesh: a mixed method study	Rohingya; Refugee; Bangladesh; Adolescent; Menstrual hygiene management	International Journal of Human Rights in Healthcare	Sanitary pads (both reusable and disposable) were used by 75% of girls in the camps-83% used absorbents provided as NFI relief goods. Qualitative findings noted the lack of absorbents provided at the camp as menstruators mentioning bringing the supplies from another camp. Also noted burial is a common practice for disposable absorbents. Research noted a lack of places for outside drying and toilet facilities located far and difficult to reach from houses.	X	X
16	(Downing et al., 2021)	Menstrual hygiene management in disasters: The concerns, needs, and preferences of women and girls in Vanuatu	Menstruation, menstrual hygiene management, MHM kits, disaster, Vanuatu, women and girls Menstrual	Waterlines	Water supply and safe disposal options influenced the preference for either reusable or disposable products. Access to products, distribution process and water supply and privacy were key concerns. Lack of places to dry reusable materials in overcrowded, temporary and transit settings. Only one locally made reusable product is available in Vanuatu and it is without established acceptability and efficacy.		X

MHM Thesis Research Locations

- 📍 Lebanon
- 📍 Assam India
- 📍 Burundi
- 📍 Cox's Bazar Bangladesh
- 📍 Madagascar
- 📍 Myanmar (Burma)
- 📍 Nakivale Uganda
- 📍 Nepal
- 📍 Odisha India
- 📍 Ritsona Greece
- 📍 Somaliland
- 📍 Uganda
- 📍 Vanuatu

Image: @2021 ASSA, TerraMetrics
Produced by author on Google Maps



Figure 5- Map research locations from systematically retrieved articles. Source: TerraMetrics, created by the author on Google Maps

The humanitarian settings in the systematically retrieved research vary in geographic location (see above map, n=13 locations) and disaster scope (e.g., earthquake, flood, cyclone, protracted refugee setting). The human rights based AAAQ framework (DIHR, 2013) allowed the author to identify commonalities throughout the research in the social, cultural, and economic opportunities and challenges among menstruators and the humanitarian sector in regards to the provision of reusable menstrual supplies. Using the themes of availability, accessibility, acceptability, and quality, collective needs such as the need for reliable supplies to capture and contain blood, privacy for changing and washing, discrete disposal, and support addressing menstrual taboos and stigma were explored more deeply as well as distinctive nuances in cultural beliefs and behaviors with a focus on the opportunities and challenges to the provision of reusable menstrual supplies in a variety of humanitarian settings.

Availability

This search supports what is already well established among leading MHM researchers, that there is a lack of sufficient monitoring and evaluation (M&E) in MHM (Sommer et al., 2016; VanLeeuwen & Torondel, 2018b). While initiatives to standardize M&E in MHM are currently being piloted, beyond the scope of this study, and advocates such as Heenegan, Sommer and Schmitt are actively promoting the need for the development and use of national standards, there is still much work to be done (Sommer, M., Zulaika, G., Schmitt, M., Gruer, 2019; UNICEF, 2020). Not surprisingly, comprehensive data is not available for MHM in humanitarian settings and even more specifically, for the narrower focus on the availability of reusable menstrual health supplies (Sommer, 2012). Available quantifiable data in this review reflect small-scale, site-specific initiatives mentioned within retrieved research (Bhattacharjee, 2019; Budhathoki et al., 2018; Chaudhary et al., 2017; Downing et al., 2021; Giles-Hansen et al., 2019; Kemigisha et al., 2020; Schmitt et al., 2021; M. Tellier et al., 2020; VanLeeuwen & Torondel, 2018a). With this bias in mind, it is possible to discern a handful of themes among the existing research.

Menstrual health supplies are rarely immediately available after a sudden disaster as displayed by studies from Bhattacharjee et al. in Assam, Budhathoki et al. in Nepal, and Downing et al. in Vanuatu (Bhattacharjee, 2019; Budhathoki et al., 2018; Downing et al., 2021). In the Budhathoki et

al. study of the aftermath of the 2015 earthquake in Nepal, research showed that ‘most respondents’ did not receive any menstrual hygiene materials through relief provisions during the first month post-earthquake (Budhathoki et al., 2018). Furthermore, research by Budhathoki et al., Sommer et al., and VanLeeuwen and Torondel supports that disposable, as opposed to reusable supplies, are more likely to be provided by the humanitarian sector following a sudden disaster, if supplies are available at all. While the data is limited, the retrieved studies reflected that disposable pads are the preferred option for humanitarian organizations and thus the most readily available menstrual supply when menstrual supplies are provided in disaster settings (Budhathoki et al., 2017; Sommer, 2012; VanLeeuwen & Torondel, 2018b).

Examples within case studies, including Chaudhary et al., identify initial deliveries of non-food items (NFI) including MH supplies and/or kits (dignity or hygiene), but studies do not disclose the commonality of the practice and rarely identify if the kits include reusables (Chaudhary et al., 2017). That said, the majority of retrieved studies note the sparsity and lack of additional MH supplies following initial distribution including ‘ad hoc approaches’, ‘uneven distribution’, and ‘insufficient and unavailable’ MHM with limited distribution of menstrual supplies in Assam (Bhattacharjee, 2019; Krishnan & Twigg, 2016), Uganda (Kemigisha et al., 2020) and Bangladesh (Rakhshanda et al., 2021). A 2018 literature review of MHM in emergency contexts by VanLeeuwen and Torondel highlights the absence of statements about supply renewal in many guidelines and supportive narratives from displaced populations and laments that while menstruators received items upon arrival in refugee settings, subsequently their MHM needs were no longer met (VanLeeuwen & Torondel, 2018b).

Research by Sommer et al. and VanLeeuwen and Torondel tie availability disruption to accountability, or lack thereof, in disaster settings (Sommer, 2012; VanLeeuwen & Torondel, 2018b). Research by Giles-Hansen et al. in East Africa as well as studies by Schmitt et al. in Bangladesh, Myanmar and Lebanon note that WASH, protection, health, education, and camp management have yet to agree on which sector is responsible for which aspects of MHM including who will provide and renew menstrual supplies to ensure tracking, awareness and procurement of the necessary supplies for uninterrupted availability (Giles-Hansen et al., 2019; Schmitt et al.,

2021). Research in Myanmar and Lebanon showed limited interpretation among humanitarian staff of what an MHM response includes as well as limited guidance across sectors and coordination between sectors resulting in lack of consistent supply to meet menstruators needs (Schmitt et al., 2017).

Reusable supplies may provide an opportunity in areas where logistics are challenged as reusables occupy less physical space to transport (15 disposable pads per month are bulkier than 6 washable pads, or 4 square meters of cloth, or a single menstrual cup) (Sphere, 2018) and can be used multiple times, allowing for fewer necessary distribution occasions, (single-use pads must be provisioned for each cycle while washable pads last for 2-3 years and menstrual cups can be reused for up to 10 years) (WaterAid India, 2019). Research by Tellier et al., Schmitt et al., and Giles Hansen et al. also shows that menstruators in disasters settings may lack the necessary physical supplies such as underwear or a strap to hold the absorbent material close to the body so that the menstruator can move, pins and a drying line to hang washable pads, or a small metal pan for boiling a menstrual cup (Giles-Hansen et al., 2019; Schmitt et al., 2021; M. Tellier et al., 2020). A single delivery of reusable menstrual supplies, including any necessary supports could provide the menstrual supply component of MHM for months or years (Krishnan & Twigg, 2016).

Studies by Giles-Hansen et al. and VanLeeuwen and Torondel note that distributions that do not meet the needs of menstruators as provisions are often linked initial surveying and assumptions about the number of menstruators in each home (Giles-Hansen et al., 2019; VanLeeuwen & Torondel, 2018b). For example, a community needs assessment may show three individuals of reproductive age living within a home while a menstruator with an early onset of menarche (something a family may want to hide because of pressure to marry early or soon after first menstruation) or a late onset of menopause may also live in the home (M. Tellier et al., 2020). Furthermore, the humanitarian distribution may provide only the amount of absorbent recommended by the Sphere Handbook but the menstrual cycle of an individual may demand additional supplies to contain the blood so an individual may need to borrow, buy or trade for additional supplies from another menstruator (Downing et al., 2021).

A reusable availability issue highlighted in VanLeeuwen and Torondel's "Improving Menstrual Hygiene Management" literature review is the lack of 'innovative' supplies such as menstrual cups, menstrual underwear in low income-settings and highlights limited evidence of research examining reusable products in many humanitarian settings (VanLeeuwen & Torondel, 2018a). Lack of evidence examining reusable products in humanitarian settings may contribute to lack of the humanitarian sector including reusable products as menstrual supply options. Without supply availability in the local community, the humanitarian sector may struggle to source the supplies locally. Furthermore, lack of local availability may inhibit menstruators from continuing to use the product after the humanitarian efforts subside (Schmitt et al., 2017). While reusable supplies offer an advantage as they can be used for years, should a menstruator lose or accidentally drop their cup into a latrine or should something damage their cup, for instance, a critter/rat partial to the silicone material or the fire while sterilizing the cup, it could be difficult, in some communities, for the menstruator to replace the cup.

Of course, the availability of menstrual health supplies, disposable or reusable, within a disaster setting is not enough to enable and empower menstruators to manage their menstruation with dignity, it is also necessary to consider the aspect of accessibility.

Accessibility

While menstrual supplies may be 'available' in a humanitarian setting, menstruators may not have access to the supplies or may not have access to the necessary supports to utilize the supplies.

There are many challenges to supply accessibility in disaster settings, from disrupted logistics, transportation, and supply chains to issues closing the last mile and delivering supplies where they are needed most. Research in Vanuatu from Downing et al. notes the challenge of logistics in and the commonality of delays and obstacles including disruption to fuel supply and washed out roads and bridges. (Downing et al., 2021).

Once supplies reach a setting, individual menstruators may experience access challenges to receive the supplies. Unforgiving and dangerous walking paths, lack of access to transportation to

distribution sites, feeling intimidated or embarrassed asking for, receiving, or walking home with the supplies provided were all noted obstacles in studies by Downing et al., Krishnan et al., and Sommer et al. (Downing et al., 2021; Krishnan & Twigg, 2016; Sommer et al., 2020). Downing et al. in Vanuatu noted the importance of the social aspects of the distribution process including menstruators desire for female led, discrete distribution that does not attract the attention of men and boys (Downing et al., 2021). In addition, studies by Krishnan et al. and Tellier et al. note that MHM distribution allocation may be even more challenging for menstruators with disabilities and menstruators who do not identify as female as well as menstruators from marginalized groups due to mobility issues as well as issues of oppression and exclusion (Downing et al., 2021; Krishnan & Twigg, 2016; M. Tellier et al., 2020).

Once the menstruator receives the supplies, they must also have access to supportive facilities to use the products safely and hygienically (Rakhshanda et al., 2021; Sommer et al., 2016). All retrieved articles discussed the need for discrete space for menstruators using reusables to change their menstrual supplies as well as a private space for washing (pads, cups and underwear) and to hang washable pads and cloth (preferably in direct sunshine) to dry fully where others, especially men and boys will not see the materials (Kemigisha et al., 2020). Pads, both disposable and reusable, need to be changed every 4-6 hours while menstrual cups can be worn for up to 12 hours. Extensive research from Schmitt et al. and others exists on gender friendly and mobility accessible toilets and washing spaces (Downing et al., 2021; Schmitt et al., 2021). But, research from Schmitt et al. notes that 'to date there has not been sufficient attention towards ensuring that WASH service are supportive of the use of reusable menstrual materials' (Schmitt et al., 2021).

An advantage for reusables is that they do not require the comprehensive product disposal system of single-use products. While regular access to discrete disposal is not an issue for reusable products, as reusables can be used for years, the provision of single-use pads necessitates safe, discrete disposal options for every menstruator each cycle. Research by Rakhshanda et al. and Schmitt et al. in Bangladesh note the pervasive cultural beliefs and stigma relating to fears of menstrual blood being seen by others and the risky coping strategies menstruators adopt when

acceptable changing and disposable options are not available (Rakhshanda et al., 2021; Schmitt et al., 2021). Without a support system for disposal, menstruators may prematurely fill latrines by disposing pads in latrines, attempt to flush pads down toilets resulting in clogged pipes, throw in open fields, rivers, or the sea potentially harming the environment, and/or subject themselves to unsafe rituals to bury or burn used products (see more in acceptability) (Krishnan & Twigg, 2016; Schmitt et al., 2021).

An important access issue is economic feasibility for both the humanitarian sector as well as individual menstruators (VanLeeuwen & Torondel, 2018b). While reusable products such as washable pads, menstrual cups, and period underwear cost more upfront than single-use pads, research from Tellier et al. in Uganda shows the long term the cost to be advantageous. According to work from NGO, WoMena, disposable pads cost 18–35 USD per year, reusable pad kits cost around 5 USD per kit and last 1–2 years, while cups sell at 5–15 USD and last up to 10 years (M. Tellier et al., 2020).

An additional aspect of economic feasibility mentioned by three retrieved studies from Sommer et al., Schmitt et al., and VanLeeuwen and Torondel relates to the potential misuse in regards to menstrual supplies of cash vouchers, a recent development in the humanitarian sector (Schmitt et al., 2017; Sommer et al., 2016; VanLeeuwen & Torondel, 2018b). The studies note concerns about who collects the cash and how much of the cash is shared with menstruating family members and discuss the possibility of subjecting menstruators to restrictions on product choice such as only allowing menstruators to purchase cheaper products that may not fulfill their needs or preferences or subjecting them to restrictions on the amount of product purchased (Schmitt et al., 2017; VanLeeuwen & Torondel, 2018a). Findings from Schmitt et al. in Myanmar and Lebanon noted that women often have less decision-making power in the household and less ability to prioritize MHM when household income is restricted (Schmitt et al., 2017). Since reusable products cost more upfront, menstruators could be subjected to restrictions from the family member allotted the voucher (Schmitt et al., 2017; Sommer et al., 2016; VanLeeuwen & Torondel, 2018b). On a similar note about equity, autonomy and power, from Downing et al. in Vanuatu and Schmitt et al. in Bangladesh expressed the importance of access for menstruators voices in

discussions planning washing, bathing, and changing facilities, distribution sites and processes and in planning ways to address the stigma and taboo of menstruation (Downing et al., 2021; Schmitt et al., 2021).

Once the menstrual supplies are available and the supplies and supports are accessible so that menstruators can utilize the products, the supplies must also prove acceptable for menstruators to be willing to use them to manage their cycle.

Acceptability

Cultural acceptability and user preference are among the most discussed themes in the MHM research retrieved for this study. A menstruator's interest in and willingness to accept a menstrual supply is linked to their access to the product and the support necessary to utilize the product as well as preexisting perceptions about the product and a menstruators willingness to find workarounds for non-supportive structures in exchange for the benefit of the product. All retrieved studies noted the importance of considering the cultural and personal beliefs of menstruators when attempting to support their MHM.

A menstruators cultural and personal beliefs may influence many aspects of their MHM. For example, if a menstruator believes that a curse may be placed on them should others see their menstrual blood, as discussed in research identified by Schmitt et al., the menstruator may still use a disposable menstrual pad because it is the hygienic absorbent supply available or because it is more convenient than another option (Schmitt et al., 2021), but they may take pronounced, and even risky measures to ensure that the blood is not seen by anyone, such as leaving their home before sunrise or after sunset to walk to a private, secluded place to bury or burn the used pads as in research identified by Budhathoki et al. in Nepal and Krishnan and Twigg in a post-disaster case study of Cyclone Phailin, Odisha (Budhathoki et al., 2018; Krishnan & Twigg, 2016), or dispose the used pads in a plastic bag weighted down by stones in the river as was the practice for study participants in flood-prone districts of Assam (Bhattacharjee, 2019).

While this systematic review highlights the limited amount of published research focused on reusables, dozens of smaller, grey literature, studies from NGO and INGOs including many UN agencies and social entrepreneurial companies are referenced within the retrieved articles and discuss issues of cultural acceptability and user preference with reusable products, but only three articles retrieved in this review had a specific focus of reusables: the exploration of menstrual cup acceptance in Uganda by Tellier et al.; perceptions of menstrual underwear acceptance in Greece by VanLeeuwen and Torondel; and an exploration of the potential of reusable products in Nepal by Budhathoki et al. All three showed positive perceptions of reusable product acceptance (Budhathoki et al., 2017; M. Tellier et al., 2020; VanLeeuwen & Torondel, 2018a). While the studies in Uganda and Greece, the two pieces of new research, were conducted in long-term refugee settings, Budhathoki et al. focused on reusable menstrual supplies in immediate acute emergencies/ crisis settings, the aftermath of the Nepal earthquake. Budhathoki et al. used evidence from a review of the humanitarian response to the Nepal earthquake of 2015 by Chaudhary et al. to argue that reusable products, accessible and already familiar to the affected population in Nepal, could provide a vital resource in times of short-term crisis (Budhathoki et al., 2018; Chaudhary et al., 2017; VanLeeuwen & Torondel, 2018b) and would serve as appropriate menstrual supplies in the event of another crisis (Budhathoki et al., 2017).

While supply acceptance and preference may vary, depending on the options available to menstruators, the consideration of acceptance should serve as a minimum standard. Menstruators may accept a product because it is the only menstrual supply available, but they may develop preferences for products once they are aware that the product exists, deem that the product aligns with their cultural practices and beliefs, and believe that they could manage their menstruation using the product in the context in which they are living. Research from Budhathoki et al., Giles-Hansen et al., and Schmitt et al. show that for many menstruators, access to and preference for disposable pads developed from humanitarian provisions in disaster settings. While prior to the disaster, menstruators used reusable absorbents like cloth or washable pads (Budhathoki et al., 2018; Giles-Hansen et al., 2019; Schmitt et al., 2021). A potential challenge for the provision of reusable supplies is if menstruators have established a preference for disposable

products and perceive reusable products provided by the humanitarian sector as less convenient, reliable, or comfortable.

Environmental considerations of the negative impact of disposable menstrual supplies were only minimally mentioned as influencing acceptability for menstruators or the humanitarian sector. When mentioned, concerns revolved around WASH and the improper disposal of single use products such as disposable pads filling latrines or increasing unsightly and improperly managed solid waste (Schmitt et al., 2017). Retrieved research did not mention any concerns about landfills, plastic production, extended degradability, carbon footprint, or air quality hazards from the burning of plastic. Based on the lack of reference in the research, these issues do not appear to be linked, yet, to menstrual supply acceptance for either the menstruator or the humanitarian sector. One reason might be the short-term, acute nature of a crisis disaster response or the expectation that a population in a protracted crisis will only inhabit a space temporarily (e.g., a refugee camp), even if the reality is that camps often remain for years beyond the initial plan. A perception of short-term response may limit humanitarian and/or menstruators' concerns about the longer-term impacts or damage to the setting that could result from disposable menstrual waste and result in a lack of correlation between the potential long term impacts and menstruator or humanitarian staff acceptability of single-use disposable menstrual products (Rakhshanda et al., 2021).

One additional issue, noted in research by Tellier et al. regards cultural acceptance as it pertains to products worn inside the body. Products such as tampons and menstrual cups may not align with the cultural practices or beliefs of a menstruator or their community because of concerns that a product worn inside the vagina could damage the hymen, compromise virginity, spur sexual arousal, or promote promiscuity (M. Tellier et al., 2020). Even when perceptions are unfounded, menstruation supplies should be a personal choice where menstruators accept supplies that align with their cultural and personal beliefs. Therefore, it is important to strongly consider offering reusable pads or cloth along with internally placed products such as menstrual cups until education and acceptance of internally worn products is universal. Research from many of retrieved studies, including work from Budhathoki et al., Tellier et al., and VanLeeuwen and

Torondel et al. confirms the importance of honesty, information, and choice in empowering menstruators to make the best decision for themselves (Budhathoki et al., 2018; M. Tellier et al., 2020; VanLeeuwen & Torondel, 2018a, 2018b).

Once reusable menstrual health supplies are available, accessible, and acceptable in a disaster setting, the issue of quality can be explored.

Quality

This systematic review was unable to identify any quality standards for menstrual supplies (reusable or disposable) in any humanitarian settings. The word quality was only used in two of the studies, Tellier et al.'s "Practice Note" and VanLeeuwen and Torondel's "Exploring menstrual practices", to describe menstrual supplies (M. Tellier et al., 2020; VanLeeuwen & Torondel, 2018a). In both studies, the term quality described 'the importance of access to quality menstrual products' but did not refer specifically to the quality standard of any particular menstrual products. Studies outside of this review confirm that definitions and standards of menstrual supply quality do not yet exist within the MHM humanitarian sector (Kambala et al., 2020). Research within the broader topic of MHM revealed the issue of standardizing protocols to regulate quality as an important topic currently being discussed among MHM researchers in the general and humanitarian sectors (ISO International Organization for Standardization, 2018). According to the Menstrual Health Hub (*Menstrual Health Hub*, 2021) discussions include a proposal for cohesive international legislation to ensure the safety, monitoring and testing of menstrual products (ISO International Organization for Standardization, 2018; *UNFPA Shaping Market Regulations for Menstrual Hygiene*, 2021).

While the word 'quality' is not used to describe menstrual supplies in 14 of the 16 retrieved pieces of research, studies from Budhathoki et al., Downing et al., Giles-Hansen et al., Kemigisha et al., and VanLeeuwen & Torondel all describe factors menstruators would use to judge quality including: safe (will not cause harm to the body); restricts blood from leaking from the menstrual supply (prevents leaks); fits securely (does not move around in underwear); comfortable (chafing, rash, internal comfort); dries quickly; and is made of materials that can last for the expected

product lifetime (quality materials) (Budhathoki et al., 2018; Downing et al., 2021; Giles-Hansen et al., 2019; Kemigisha et al., 2020; VanLeeuwen & Torondel, 2018a). In addition, Kemigisha et al.'s study in Uganda with adolescent girls living in the Nakivale refugee settlement, describes the use of 'unsuitable alternatives' or 'inappropriate hygiene materials' that lead menstruators to 'self-isolate in fear of staining clothes or embarrassment' (Kemigisha et al., 2020). Lack of quality, for menstruators is often centered around leaking and the many measures menstruators utilize to ensure leak protection, including searching for absorbable supplies and saving limited reliable products for days when the menstruator most desires to engage in activities outside the home or for when they believe they will experience heaviest flow (Schmitt et al., 2017).

VanLeeuwen and Torondel's study noted that menstruators in a Middle Eastern population living in a refugee setting did not have a means to compare product quality since they had only been exposed to the products, one brand of disposable pads, supplied by the humanitarian sector, as they previously used old cloth to collect their menstrual blood, 'We did not know which one was good. We just used whatever we found,' said a 18-29 year old study participant (VanLeeuwen & Torondel, 2018a). In addition, the same authors' literature review of current perspectives from 2018 notes a lack of evidence examining innovative menstrual products such as cups and menstrual underwear in humanitarian settings (VanLeeuwen & Torondel, 2018b).

Regardless of the lack of quality standards for menstrual supplies, studies within VanLeeuwen and Torondel's 2018 literature review suggests that the humanitarian sector has identified the single-use disposable pad as the gold standard, while studies from Nepal, Myanmar and Lebanon including those from Budhathoki et al. and Schmitt et al. disclose that menstruators, who have received single-use disposable pads from humanitarian provisions, may develop a preference for disposable pads and a perception that the single use pads are more comfortable, more hygienic, less likely to leak and more likely to remain in place in underwear (Budhathoki et al., 2018; Schmitt et al., 2017). Budhathoki et al. even argue in "Reusable sanitary towels: Promoting menstrual hygiene in post-earthquake Nepal," that the humanitarian sector's provision of single-use pads creates the perception that disposable pads are of superior quality (Budhathoki et al., 2017).

In addition to the lack of standards for the quality of reusable menstrual supplies, this review also exposed a lack of published literature about quality standards for MHM supportive facilities, education/information and disposal systems. An example from the disposal aspect is the lack of mandates and specifications for the quality of disposal options including published research on solid waste management, landfills, and incineration. The design, quality, and operation of menstrual product incinerators, a recent development in the humanitarian sector, for the disposal of single-use products is important to consider. The recent trend to produce locally made incinerators was discussed in articles from Schmitt et al. and Sommer et al., but neither mentioned standards for incineration or concerns that the incinerators may burn materials at lower temperatures resulting in plastics releasing higher quantities of dioxins, furans and biphenyls or the production of harmful residue as a byproduct of the incineration process. While incinerators can be designed to achieve safer plastic burning temperatures, above 800 degrees Celsius, these quality specifications are more expensive and complex to achieve (Schmitt, M.L., Clatworthy, D., Gruer, C., Sommer, 2020; Sommer, Schmitt, et al., 2017).

While Sphere and other standards recommend the quantity of supplies and consultation with menstruators to understand their preferences, guidelines do not include specifications about quality or advice on how to determine menstrual supply quality. This research confirms an opportunity to define quality for menstrual supplies in the reusable menstrual product category as well as across menstrual supplies and supportive facilities in disaster settings.

Discussion and suggested strategies

This systematic review includes 15 articles focused on MHM in humanitarian settings from peer reviewed journals and one book chapter. Twelve articles are from original studies (n=4 qualitative, n=4 mixed method, n=2 case study, n=2 literature reviews) and the remaining include a book chapter, practice notes and a recommendation article.

Through extraction and analysis of relevant information, specific to the provision of reusables, within all 16 systematically retrieved articles, this review aims to expand on existing available information related to reusables in MHM in humanitarian settings. The author's intention is not to

provide a critical appraisal of the included studies, but a deeper dive into and summary of the opportunities, challenges, and strategies, through a human rights framework, identified in the consideration of the provision of reusables in humanitarian settings.

The AAAQ human rights framework (DIHR, 2013) provides a tool to unite the commonalities among a variety of humanitarian settings including providing MHM in sudden disaster settings such as in response to earthquakes in Nepal, floods in Assam, and cyclones in Vanuatu, as well as long term protracted environments such as managing MHM in refugee and internally displaced person (IDP) settings in Greece, Lebanon, Uganda, Bangladesh, and Myanmar. While the geographic locations and conditions within the reviewed research vary significantly, the human rights themes ground and tether the research to important considerations for both the menstruator and the humanitarian sector through focusing on the social, economic, and environmental opportunities and challenges in the provision of reusable menstrual supplies in humanitarian settings.

Analysis identifying and exploring the specific opportunities and challenges for reusable menstrual supplies is important because while there is consistency throughout the literature about the essential components necessary for adequate MHM (menstrual supplies, supportive facilities, and information) (Sommer, Schmitt, et al., 2017), published evidence is lacking regarding the application of MHM in humanitarian settings and limited evidence is published about the success and challenges of MHM programs in humanitarian settings (VanLeeuwen & Torondel, 2018b). These gaps become even more apparent when seeking to garner knowledge specifically about reusable menstrual supplies. The provision of reusables in humanitarian settings was suggested in some of the systematically retrieved research, but only three articles retrieved focus specifically on reusable menstrual supplies in humanitarian settings, VanLeeuwen and Torondel's qualitative study gaging the hypothetical acceptability of menstrual underwear among a refugee population in Greece, Tellier et al.'s book chapter highlighting the introduction of menstrual cups in Uganda and comparing menstrual cup acceptance with menstrual supply provisions after the Nepal earthquake, and one personal view, authored by Budhathoki et al. focused on the advantages of

reusables following the Nepal earthquake (Budhathoki et al., 2017; M. Tellier et al., 2020; VanLeeuwen & Torondel, 2018a).

While published research about MHM in the humanitarian sector is limited, and even more limited when discerning the provision of reusables versus disposables, it is believed that the distribution of single-use disposable pads is common practice and may even be considered the gold standard when MHM is provided (Smith et al., 2020; VanLeeuwen & Torondel, 2018b). Case studies in the 2018 literature review, “Improving Menstrual Hygiene Management in Emergency Contexts”, note humanitarian organizations ‘mainly distributing disposable menstrual materials’ (VanLeeuwen & Torondel, 2018b). Yet, research from Lopez, Schmitt et al. and others suggests the humanitarian sector is not addressing the lack of an ideal disposal method for single-use pads and the ecological issues that result from the provision of disposable menstrual supplies (Bhattacharjee, 2019; Lopez, 2021; Schmitt, M.L., Clatworthy, D., Gruer, C., Sommer, 2020). Landfills and incineration are the two most common ‘proper’ methods, but each has negative implications (Elledge et al., 2018; Lopez, 2021). Bhattacharjee’s research in Assam noted that the crisis of menstrual waste may be ‘aggravated’ by the distribution of disposable pads with ‘little thought give to disposal,’ ‘as there are no safe ways of disposing’ used menstrual supplies and ‘menstrual waste disposal is a challenge even in normal situations and the problem is exacerbated during floods’ (Bhattacharjee, 2019).

In addition, single-use disposable pads are not always menstruators’ preferred method of capturing and containing menstrual blood as menstruators in low income humanitarian settings may be unfamiliar with disposable pads as well as the process of finding safe, discrete disposal options that align with their cultural beliefs, as emphasized in UNICEF’s “Guide to Menstrual Hygiene Materials” and research recognizing the gaps in MHM in humanitarian settings by Sommer et al. (Roeckel et al., 2019; Sommer, 2012).

Using the AAAQ human rights lens enabled the author to explore and describe solutions proposed in the 16 pieces of retrieved research (see complete listing in Table 4) and to discuss strategies suggested within the research to address the barriers to the provision of reusable supplies

including: establishing, promoting and adopting quality standards for reusable supplies; consulting and collaborating with menstruators to determine preferred methods and tools to better support menstruators use and the choice of reusable menstrual supplies with a particular focus on honest, clear, information about product use to support positive attitudes and knowledge about reusable menstrual supplies; support for discrete, accessible menstruator friendly distribution methods including consideration of how menstruators will access reusable supplies when the humanitarian effort is complete, as well as supporting menstrual friendly toilets and washing facilities to assist reusable product use; and a focus on ensuring that reusable menstrual products are immediately and continuously available in all humanitarian settings, in both short and long term responses.

The following solutions were identified in the retrieved research and are discussed in AAAQ reverse order beginning with quality, acceptability, accessibility and ending with availability.

Quality

Establishing, promoting, and adopting quality standards for menstrual supplies is vital to ensuring that standards are met (House et al., 2012). Quality standards are particularly important for reusable menstrual supplies such as washable pads, menstrual cups, and period underwear because these products are often considered innovative and new, and menstruators and or humanitarian staff may not have been exposed previously to these reusable products so they may not have an existing level of trust or confidence in the products as recognized by Schmitt et al. in “Innovative strategies for providing menstruation supportive WASH facilities” (Schmitt et al., 2021). Furthermore, as noted by Tellier et al., reusable products have a higher upfront cost than single-use disposable pads (M. Tellier et al., 2020). Therefore, it is even more important that both menstruators and the humanitarian sector feel confident that reusable menstrual supplies are safe and of suitable quality to be considered or provided as viable options. A level of quality must be established so that supplies can be measured against it (van Eijk et al., 2019).

Acceptability

Throughout the research, a noted theme was the importance of consulting menstruators when designing interventions (Rakhshanda et al., 2021; Sommer, 2012; VanLeeuwen & Torondel,

2018b). Consulting and collaborating with menstruators allows humanitarian staff to determine preferred supply methods and to identify tools to better support the use of reusable menstrual supplies. Armed with this knowledge, the humanitarian sector is more likely to provide supplies that will be appropriate and acceptable and used for menstrual management instead discarded, misused, sold or traded, or wasted (Bhattacharjee, 2019; Giles-Hansen et al., 2019).

For menstrual supplies to be acceptable for use, the supply must align with menstruators' cultural and personal beliefs (Krishnan & Twigg, 2016; Sommer, 2012). A menstruator's willingness to choose or accept a reusable supply may link with their personal beliefs about the supplies. Since reusables are new to many menstruators, especially in low income humanitarian settings, according to Sommer's influential work, "Menstrual hygiene management in humanitarian emergencies: gaps and recommendations", menstruators may not have experience with or knowledge about some supplies (Sommer, 2012). Therefore supplies that more closely align with a menstruator's existing awareness and confidence in managing their menses, may be the most beneficial (Budhathoki et al., 2018; Downing et al., 2021). For example, when a menstruator has experience using a traditional supply such as cloth, and an option such as a reusable pad is available, the switch to reusable pads may present a more seamless transition as the reusable pads can be washed, dried, and stored in a manner like the previously used cloth. Whereas, the introduction of a new product, such as menstrual cup, is likely to require additional education and support before the menstruator feels comfortable using the cup (Schmitt et al., 2021). An additional consideration, mentioned for the menstrual cup is the requirement for vaginal insertion and removal, as the cup is worn internally. As noted by Tellier et al. from research in Uganda, a product that requires internal use and may not align with a menstruator's cultural beliefs or personal comfort in inserting and removing the supply (M. Tellier et al., 2020). Acceptability is highly subjective and should not be generalized but instead understood in each setting.

Suggestions for programs emphasize increasing acceptability of menstrual supplies through information and education to strengthen awareness about supply options and instruction for how to use reusable products. The importance of broader education about MHM is emphasized in nearly all retrieved studies. An increase in awareness of the impact of MHM on menstruators'

lives, tools for managing MHM including solutions for basic pain management and knowledge of how and when to reach out for medical support should the menstruator have reason to believe that their menstrual cycles are abnormal are all suggestions to support acceptability and particularly emphasized in research from Kemigisha et al. and Rakhshanda et al. in refugee camps in Greece and Bangladesh respectively (Kemigisha et al., 2020; Rakhshanda et al., 2021). The importance of a focus on honest, clear information about product use and maintenance is advised to support attitudes and knowledge about reusable menstrual supplies (M. Tellier et al., 2020). Furthermore, although menstrual supply choice is not always economically or logistically feasible, studies such as Bhattacharjee's in Assam note that programs offering a choice of reusable supplies or supplies including reusables along with education, allow the menstruator to make informed decisions about which product(s) most suit their needs (Bhattacharjee, 2019; VanLeeuwen & Torondel, 2018b). Downing et al.'s study noted that menstruators in Vanuatu used disposables in times of water scarcity and reusables when water was available for washing reusable pads (Downing et al., 2021). While menstrual waste is not eliminated in this scenario, the solid waste generated would be reduced as fewer disposable pads are used.

Research unanimously suggest that menstruators should remain the focus of interventions and that menstruator experience, perceptions and needs must form the foundation of planning and response. But, gaps and recommendations research from Sommer et al. as well as studies referenced in the literature review from VanLeeuwen and Torondel emphasize the importance of including non-menstruators (men, boys) in planning, education, and efforts, as perceptions must also change in non-menstruators to reduce stigma and taboo (Sommer et al., 2016; VanLeeuwen & Torondel, 2018b). The importance of influencing opinion leaders to address menstrual shame, was noted in work from Downing et al., acknowledging that authority may rest within the males in communities where traditional patriarchal structures remain and men make decisions about goods and resources (Downing et al., 2021). For example, as Giles-Hansen et al. noted when male community leaders oversee decisions about the design of WASH facilities, menstrual waste disposal options and/or the choice of available menstrual supplies (Giles-Hansen et al., 2019). Non-menstruators may be key influencers in need of additional education and reassurance before they are willing or able to support menstruators with acceptance and use of reusables or an

increased need for water while menstruating as noted in Sommer et al. global review (Sommer et al., 2016).

Accessibility

The importance of considering how menstruators will access reusable supplies is also a prevalent discussion throughout research solutions. Suggestions include establishing discrete, accessible for all (including those with mobility issues as well as minorities, including gender minorities, and oppressed community members) menstruator friendly distribution sites to access menstrual supplies and supportive supplies, such as underwear and soap for washing reusable pads or a small pot for post-cycle menstrual cup boiling. Research from Downing et al. in Vanuatu shows menstruators preference for accessible distribution sites that are operated by knowledgeable females or compassionate males in locations that are relatively close to menstruators' homes and distributed in discrete packaging so that others are less likely to mock the menstruators as they carry their supplies home (Downing et al., 2021; Sommer, 2012). As mentioned in the analysis, reusables may offer an opportunity as they can be concealed easier and require less restocking and redistribution.

Once menstruators receive the supplies, supportive facilities such as menstrual friendly WASH facilities, toilets and washing spaces with access to water, are needed to provide menstruators with adequate space to properly use reusable supplies. Research also unanimously suggests that clean facilities that are accessible for all help menstruators feel comfortable changing, washing and drying reusable pads or menstrual underwear and provide privacy for menstrual cup users to empty and rinsing cups. Menstruators using reusable pads need access to soap and water (15 liters per menstrual cycle for washable pads) to wash and space to change and thoroughly dry (preferably in the sunshine) pads (Kemigisha et al., 2020; M. Tellier et al., 2020). While menstrual only require 1 liter of water per cycle to wash and a post-cycle/monthly 10-minute boil but do not require the same level of support for drying (M. Tellier et al., 2020). Supportive facilities are important solutions discussed in all articles and are part of the three suggested essential recommended components of any MHM humanitarian response (Sommer, Schmitt, et al., 2017).

Although solid waste disposal is not as significant of an issue when reusables are provided, studies in Uganda, Bangladesh and Vanuatu note that menstruators using reusables are concerned about others seeing their menstrual blood in the runoff from facilities where they wash pads or in latrines where they empty their menstrual cup (Downing et al., 2021; Kemigisha et al., 2020; Rakhshanda et al., 2021; Sommer, 2012). Suggestions from Krishnan and Twigg include designing washing facilities so that blood does not wash into visible open drains, using non-transparent pipes leading greywater from washing facilities, and designing outdoor drying areas hidden from the general view for cloth, pads or underwear (Krishnan & Twigg, 2016). If menstruators do not have access to water and a discrete space for washing reusable pads or cloth, they may seek disposal methods in line with their cultural beliefs, and search for a private, discrete place to bury or burn used reusable pads, which can result in safety risks and additional challenges humanitarian settings as well as disregard the benefits of and cost savings of a multiple use product (Schmitt et al., 2018, 2021).

Availability

Finally, a focus on ensuring that reusable menstrual products are immediately and continuously available in all humanitarian settings, in both short- and long-term responses. Research from Sommer's shows that menstrual management is often difficult for the humanitarian sector to support due to factors including the lack of clearly defined MHM roles in humanitarian settings (Sommer, 2012). Traditionally MHM was associated with the WASH sector because of links to menstrual supply disposal but MHM has also been facilitated by protection, shelter, health, education, and other sectors (Sommer et al., 2016). While the acknowledged need by many sectors is validating, it can also lead to a lack of accountability by any single sector. A prevalent suggestion is to more clearly define MHM accountability for each humanitarian setting and for each stage within the response (VanLeeuwen & Torondel, 2018b).

Implications for practice, policy, and future research

While research from a 2018 literature review of current perspectives published by VanLeeuwen and Torondel suggests the humanitarian sector's preference for single-use disposable pads, the lack of monitoring and evaluation in MHM means that evidence about the availability of reusable

menstrual supplies and overarching norms regarding disposable versus reusable supplies, were not accessible in this review of solely peer-reviewed published research (VanLeeuwen & Torondel, 2018b). That said, prevalence in the suggestion of the humanitarian sector's preference for disposable pads, means there is opportunity to be more inclusive of reusable options. In addition, research from Bhattacharjee, Downing et al., and Sommer et al. confirms that humanitarian menstrual supply provisions influence menstruators' preferences for specific supplies, and presents an opportunity to connect menstruators with more economically and environmentally sustainable menstrual options from the start of each response (Bhattacharjee, 2019; Downing et al., 2021; Sommer et al., 2016).

MHM decision makers, especially those responsible for making decisions about which menstrual supplies to provide in a humanitarian setting, will benefit from increased knowledge of existing MHM efforts in humanitarian settings and even more specifically, of the provision of reusable supplies in MHM. Research should include a specific focus on reusable supplies, such as the percent of humanitarian settings that provide MHM and which include reusable options, which sector(s) takes responsibility for MHM in each setting and at what stage in the response, who is responsible for ensuring continuous availability of menstrual supplies, the availability of proper disposal for menstrual waste from menstrual supplies including waste management solutions for single-use disposable products. In addition, research is needed to identify how menstruators will access reusable supplies when the humanitarian effort is complete (e.g., tracking of which menstrual supplies are locally available and the potential for future locally sourced supplies).

As additional MHM studies are undertaken in humanitarian settings, it is important to monitor and evaluate new programs and any changes to existing programs to ensure that modifications do not result increased vulnerability. For example, a shift from the provision of single-use disposable pads to reusable supplies such as washable pads or menstrual underwear in a setting where support facilities for changing, washing, and drying reusable supplies are not available, may increase a menstruator's vulnerability. Menstruators may increase their safety and health risks, as noted in research from Schmitt et al. in Myanmar and Lebanon, as they seek private spaces to wash and dry reusable pads or resort to wearing pads or underwear that are not fully dry (Schmitt

et al., 2017). In addition, research documenting potential increases in environmental impacts from provisioned supplies are important factors to monitor. While it makes rational sense that reusables would have less of an impact on waste streams and reduce the production and disposal of pads and packaging that include environmentally harmful plastic, it is possible that the production of cotton or other raw material used in reusable pads could offset the negative impacts of single use pads (Viner et al., 2012). Closely monitoring solutions and programs through awareness and analysis of the impacts on menstruators and the environment is vital to understanding how to reduce the negative impacts of the provision of disposable menstrual supplies in humanitarian settings.

Thorough, credible research exploring and defining: quality in reusable menstrual products; acceptability for menstruators and the humanitarian sector of reusable products in humanitarian settings; and improved tracking of the accessibility and the availability of reusable supplies in humanitarian settings could yield insights that would better support humanitarian decision makers needs as they determine in which ways the provision of reusable menstrual supplies can address cultural, social, and economic needs while also mitigating the environmental impact of the provision of single-use disposable pads.

Limitations

Research limitations include the lack of published research in peer reviewed journals on the topic of the provision of reusables to support MHM in humanitarian settings. In addition, while a systematic review reduces bias in the search, the restrictive search of included and excluded articles means that existing relevant research could be left out of the analysis if the search strategy is too restrictive. In this case, due to limited time and thesis project constraints, the author limited the search to the three most relevant databases and the inclusion of published articles. The choice of exclusion of grey literature in the search strategy, albeit intentional, significantly limited the available research. There is a significant possibility that much MHM knowledge rests in the hands of those working on the ground as humanitarian staff and not publishing the results of their programs or efforts in academic settings. An additional limitation

could be reviewer bias in choice of thematic framework as well as coding bias as a single author/researcher coded the data in NVivo and analyzed the data.

Conclusion

Humanitarian relief efforts aim to save lives, alleviate suffering and maintain human dignity (GHD, 2013). A menstruator's ability to maintain their menstrual health and hygiene links to health, well-being, gender equality, education, equity, empowerment (UNICEF, 2020). To maintain human dignity, menstruators must be able to manage their menses safely and comfortably. MHM is challenging for menstruators to achieve in humanitarian settings due to factors including loss of access to preferred menstrual and supportive supplies, lack of privacy, disruption to routines and livelihoods (Krishnan & Twigg, 2016). Supporting menstruators' in managing their menses safely and comfortably in humanitarian settings helps them maintain human dignity (Schmitt et al., 2017).

While addressing the three essential components of an MHM humanitarian response, as defined by Sommer et al. (Sommer, Schmitt, et al., 2017), it is also important for the humanitarian sector to consider the impact of the provision single-use disposable pads, specifically on menstruators disposal options and behaviors as well as on each setting's specific waste management capabilities and the ecological impact of disposable pads. The current humanitarian focus remains on the provision of supplies, menstruator friendly facilities and information, with an interest in the problem of menstrual waste management only recently coming into view (Schmitt, M.L., Clatworthy, D., Gruer, C., Sommer, 2020). As the humanitarian sector begins to acknowledge the environmental impact of the provision of disposable pads, humanitarian decision makers will need access to information to help them evaluate the feasibility of the provision of reusable menstrual products as a strategy to reduce menstrual waste while meeting the needs of menstruators to contain and safely and conveniently dispose of menstrual blood and or used menstrual supplies.

Looking through the lens of the AAAQ human rights framework allowed the author to more thoroughly understand the social, economic, and environmental factors associated with reusable menstrual supplies noted in systematically retrieved published articles focused on MHM in

humanitarian settings. This systematic review explored the opportunities and challenges to the availability, accessibility, acceptability, and quality of reusable menstrual supplies in a variety of humanitarian settings. The AAAQ lens also enabled the author to examine and discuss suggested strategies for the provision of reusable menstrual supplies in humanitarian settings.

While the stigma and taboo that surrounds menstruation impacts both those who use disposables and those who use reusables, reusable supplies offer the opportunity to address the negative environmental impacts of single-use disposable products and may provide a more sustainable, longer lasting, affordable option. Yet, there is still much to be done to ensure that reusable menstrual health supplies are immediately and continuously available, accessible, acceptable and of quality condition in humanitarian settings. Necessary steps include the development of robust, credible, widely published, available research monitoring and evaluating the current availability and accessibility of reusable menstrual products in humanitarian settings as well as research to better understand the factors that influence reusable supply acceptability and quality. For humanitarian decision makers to confidently choose the provision of reusable menstrual supplies, awareness needs to be raised regarding not only the harmful impact of disposable pads but also the opportunities available through the provision of reusable menstrual supplies.

With this review, the author reiterates how few published studies focus on the provision of reusables to support MHM in humanitarian setting, provides a basis for those planning future research, and offers a comprehensive overview of the opportunities and challenges in the provision of reusable menstrual supplies in a variety of settings for those in a position to consider whether reusable menstrual supplies will be provided to support MHM in humanitarian settings. The author's hope is that this systematic review will contribute to discussions about managing menses socially, economically, and environmentally to provide each menstruator, even in humanitarian settings where MHM challenges are exacerbated, the best opportunity to manage their menses safely, comfortably and with dignity.

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Appendix A: Definition of menstrual health (Hennegan, J., Winkler, I.T., Bobel, C., Keiser, D., Hampton, J., Larsson, G., Chandra-Mouli, V., Plesons, M., & Mahon, 2021)

Menstrual Health

Menstrual health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, in relation to the menstrual cycle.

Achieving menstrual health implies that women, girls, and all other people who experience a menstrual cycle, throughout their life-course, are able to:

- Information about the menstrual cycle** { access accurate, timely, age-appropriate information about the menstrual cycle, menstruation, and changes experienced throughout the life-course, as well as related self-care and hygiene practices.
- Materials, facilities, and services to care for the body** { care for their bodies during menstruation such that their preferences, hygiene, comfort, privacy, and safety are supported. This includes accessing and using effective and affordable menstrual materials and having supportive facilities and services, including water, sanitation and hygiene services, for washing the body and hands, changing menstrual materials, and cleaning and/or disposing of used materials.
- Diagnosis, care and treatment for discomforts and disorders** { access timely diagnosis, treatment and care for menstrual cycle-related discomforts and disorders, including access to appropriate health services and resources, pain relief, and strategies for self-care.
- A positive and respectful environment** { experience a positive and respectful environment in relation to the menstrual cycle, free from stigma and psychological distress, including the resources and support they need to confidently care for their bodies and make informed decisions about self-care throughout their menstrual cycle.
- Freedom to participate in all spheres of life** { decide whether and how to participate in all spheres of life, including civil, cultural, economic, social, and political, during all phases of the menstrual cycle, free from menstrual-related exclusion, restriction, discrimination, coercion, and/or violence.

This definition has been developed by the Terminology Action Group of the Global Menstrual Collective. The definition of menstrual health offers a concise statement aligned with the World Health Organization's definition of health, in addition to the requirements needed to achieve menstrual health. It builds on the foundation laid by advocates for menstrual health and hygiene.

The definition was developed through a consultative process with 51 expert stakeholders from Europe, Americas, Asia, and Africa.

We encourage the adoption of this definition to unify, guide, and

inform advocacy, policy, practice, and research. The definition can be used to situate menstrual health across sectoral priorities and funding portfolios for other health priorities such as sexual and reproductive health and rights, water, sanitation and hygiene, and adolescent and women's health.

This unified definition offers a point of consolidation and foundation for partnerships to address the broad scope of this challenge.

The full citation provides an elaboration on each part of the definition, and description of the development process.

Citation: Hennegan, J., Winkler, I.T., Bobel, C., Keiser, D., Hampton, J., Larsson, G., Chandra-Mouli, V., Plesons, M., & Mahon, T. (2021) **Menstrual Health: A Definition for Policy, Practice, and Research.** *Sexual and Reproductive Health Matters*. <https://doi.org/10.1080/26410397.2021.1911618>



In collaboration with

Appendix B: Prisma 27 Steps Checklist for systematic review (Page et al., 2021)



PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	X Cover
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	X pg. 2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	X 5-14
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	X 15
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	X 16
Information sources	6	Specify all databases, registers, websites, organizations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	X 16
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	X 16
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	X 16
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	X 17-18
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	X 17-18
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	X 17-18
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	X 17-18
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	NA
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	X 17-18
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	X 17-18

Section and Topic	Item #	Checklist item	Location where item is reported
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	X 17-18
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	X 17-18
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	NA
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	X 17
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	X 17
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	X 19
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	X 19
Study characteristics	17	Cite each included study and present its characteristics.	X 20-22
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	X 17-18
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	X 20-22
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	NA
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	NA
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	NA
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	X 19
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	NA
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	X 34-43
	23b	Discuss any limitations of the evidence included in the review.	X 43-44
	23c	Discuss any limitations of the review processes used.	X 43-44
	23d	Discuss implications of the results for practice, policy, and future research.	X 41-43

Section and Topic	Item #	Checklist item	Location where item is reported
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	NA
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	NA
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	X 3
Competing interests	26	Declare any competing interests of review authors.	X 3
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	NA

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71
For more information, visit: <http://www.prisma-statement.org/>