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Consequences of Environmental Infrastructure Deficit on Water Security and Maternal Health

Adaeze Nkechi Ezirigwe

University of Nigeria, Nsukka

Abstract: ***Climate change remains a threat to the world's peace, security, and well - being, and women are not spared from these effects as they are among the most vulnerable to its negative impacts. The effects range from extreme storm events, flooding, multi - year droughts, saltwater intrusion, and long - term changes to groundwater availability threatening existing water and sanitation systems. The deepening climate crisis with its plethora of worsening environmental infrastructure deficit has become a source of concern for women all over the world more so in Africa as there is a further drawstring on water security and health burdens. The health effect can be seen in pain, fatigue, perinatal health problems, disability related to musculoskeletal disorders, and work performance or satisfaction. Incidents and fear of physical and sexual violence, stress, or self - reported mental health and general health status. Though women outnumber men in the world population and bear the most burden of environmental infrastructure deficit and water security matters, they barely have representation in Government's decision - making or policymaking programs throughout the world. This paper tends to review observational and interventional studies conducted globally to identify the consequences of environmental infrastructure deficit on water security and maternal health; identify key themes for addressing health burdens associated with water security/insecurity, women, climate change, and policymaking. This will be by interrogating the question, does environmental infrastructure deficit on water security cause health burden among women? If it does; what can female participation in policymaking engender? In conclusion, women can address the issue of climate change from different perspectives through indigenous knowledge. They can take significant roles in policymaking. This area of interest which is less explored has good potential for further research.***

Keywords: Climate Change, Women, Health, Environmental Infrastructure Deficit, Water Security, Policy

1. Introduction

Sustainable systems rely on the availability of environmental infrastructure; these can include safe drinking water sources, clean energy sources, green landscaping, disaster prevention, and early warning systems (Wang and Hua, 2021). It is through water that climate change can be felt to its fullest extent; women and children are the most vulnerable to its impacts. Extreme storm events, flooding, multi - year droughts, saltwater intrusion, and long - term changes to groundwater availability threaten existing sources and sanitation systems. Globally, climate impacts are increasing, and are projected to continue to accelerate over the next few decades, making SDG 6 a more challenging goal to meet, especially so for poor countries and vulnerable communities, with fewer resources available for response and adaptation. With communities increasingly affected by climate change and water and sanitation systems, it is clear that assessing climate change risks and building their resilience is an important element of sectoral program design as well as resource allocation, implementation, and monitoring.

The UN has set 19 global goals by 2030, with goal 11 being universal and equitable access to safe and affordable drinking water for all. 'Proportion of the population using safely managed drinking water, which includes the availability of clean drinking water on the premises and the absence of microbiological and chemical contamination is an indicator of this goal (WHO, 2017). Well - maintained piped - water systems are key to meeting 'safely managed' drinking water standards. Despite SDG 5 (Achieve gender equality and empower all women and girls), SDG 6 won't be achieved without concerted, deliberate, and transformative action on gender inequalities. Water, sanitation, and hygiene (WASH), as well as water resources management sectors, have focused on the interrelationship between SDG 5 and 6, however, significant gaps in understanding remain, primarily due to poor data collection and management systems, and gender - blind approaches (Grant et al., 2019). Gender equality and WASH have a complex relationship, including differences in roles (e. g., the method of carrying water), who makes decisions (about water management systems, allocations, and ownership), as well as different needs (e. g., menstrual hygiene management, cooking) and different types of knowledge (e. g., household sanitation and hygiene).

As a term, water security identifies all the many forms of water challenges being faced by the global community both at high - income and low - income levels. The UN - Water in 2013 defined water security as "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well - being, and socioeconomic development, for ensuring protection against water - borne pollution and water - related disasters, and for preserving ecosystems in a climate of peace and stability". Within the context of water resources, it refers to the availability of an acceptable amount and quality of water for health, livelihood, ecosystems, and production, while balancing the risks of water use with the economic and social implications of it. In 1996 as a result of the introduction of water security, the Global Water Partnership and the World Water Council were formed (Biswas, 1999 Worldwide water crises include freshwater scarcity, deleterious water excess along with coastal areas, and biological and chemical contamination in water bodies. The availability, access, use, stability, and reliability of water are also considered in the definition of water security. Access and use of the water depend on availability, while stability is determined by the recall ability of the water

provider. Investigations of water security at household levels by Patrick Webb and Maria Iskandarani (1998) brought out that water access affected people's well - being.

2. Study Design

In this review, a broad - based content analysis was conducted following PRISMA guidelines. In the investigation, key points identified by the studies were included concerning the water security - carriage and gender correlation and the interrelationship between this and maternal health and policymaking.110 articles and publications were identified, out of which 80 were excluded based on articles insufficiently engaged the study domain, no gender component articles, no water security components articles, articles that could not be assessed, articles that had no full texts or articles that had no maternal health component. In the end, a total of 30 articles were included in this research.

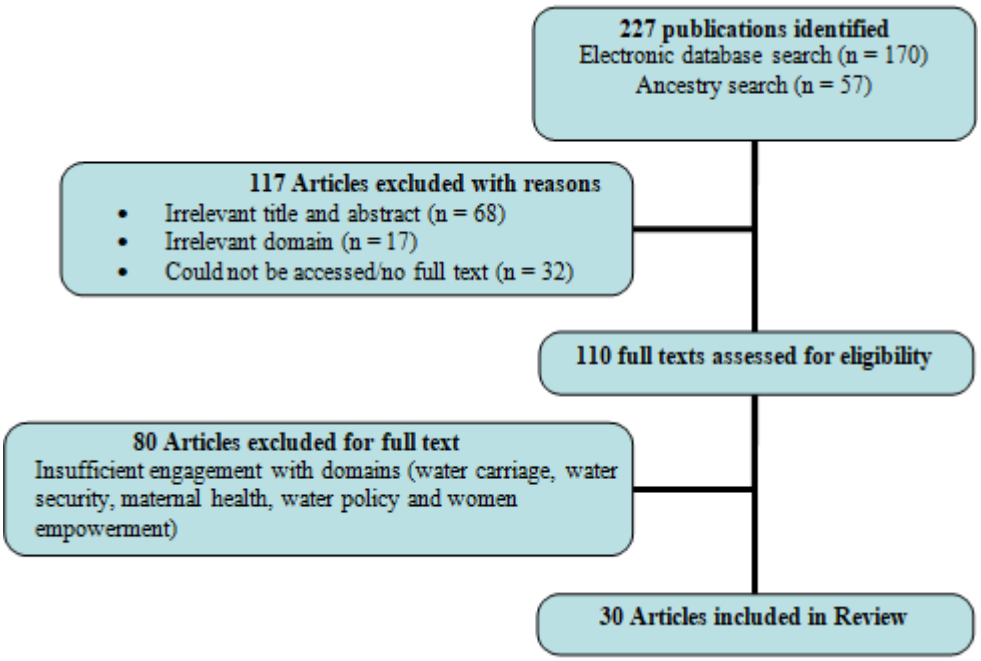

Figure 1: PRISMA flow diagram of publications considered for the review

Table 1: Summary of studies that engaged environmental infrastructure deficit on water security as it affects maternal health

Title and Domain of Discussion	No. of Articles	Researcher/ Year
Water carriage and the role of women	12	Hunter, L. M. (2006); Ray I (2007); Hunter, P. R., MacDonald, A. M., Carter, R. C., (2010); Wang X, Hunter PR (2010); Pickering A. J., and Davis J. (2012); Anderson K, Clow B, Haworth - Brockman M. (2013); Graham, J. P., Hirai, M., Kim, S. S., (2016); Graham JP, Hirai M, Kim S - S (2016); J. L. Geere, M. Cortobius, J. H. Geere, C. C. Hammer, P. R. Hunter (2018); Angoua et al. (2018); World Bank (2019); Geere JL, Hunter PR. (2020).
Water security and maternal health	10	Sorenson SB, Morssink C, Campos PA. (2011); Gabrielsson S, Ramasar V (2013); Chaudhuri, I. N. (2017); Leder S, Clement F, Karki E. (2017); Bisung and Elliott (2018); Geere, J. A., Bartram, J., Bates, L., Danquah, L., Evans, B., Fisher, M. B., et al. (2018); Caruso BA, Cooper HLF, Haardörfer R, et al (2018); UN - Water (2013); Caruso, Bethany & Conrad, Amelia & Patrick, Madeleine & Owens, Ajile & Kviten, Kari & Zarella, Olivia & Rogers, Hannah & Sinharoy, Sheela. (2021); justone. org (2021).
Water Policy and women empowerment	8	Gabrielsson S, Ramasar V (2012); Mandara CG, Niehof A, van der Horst HM. (2013); Kholif, M. T., and Elfarouk, A. M. (2014); Yerian S, Hennink M, Greene LE, Kiptugen D, Buri J, Freeman MC. (2014); Coulter JE, Witinok - Huber RA, Bruyere BL, Dorothy Nyingi W. (2018); Osamor, P. E., and Grady, C. (2016); Sinharoy SS, Caruso BA. (2019); Grant M, Soeters S, Bunthoeun I, Willetts J (2019)

3. Discussion

It was suggested by Howard and Bartram (2003) that basic access levels (time taken from and to water collection points) should be less than 30 minutes. This has been reiterated by WHO and stands as a rule of thumb for developing countries. The mean time needed to fetch water in sub - Saharan Africa is approximately 30 minutes (UNICEF and WHO, 2012). Although depending on the number of household members and the method of moving water, multiple trips a day may be required, substantially increasing the total amount of time spent during the day (Hemson, 2007; Geere et al., 2010a; Sorenson et al., 2011). According to this article, water security is compromised by the need to continue fetching water for household use in many regions of the world, due to the reliance on manual labour. The increased access to safe drinking water, which is commonly expected to result in sustainable growth, is not likely to happen unless efforts are made to reduce the

hardship of fetching water. On average, 5km walks are taken by women daily carrying 20 litres of water to make available clean water for their families (OXFAM, 2019). Even though there is data showing men do this work in some regions and urban areas especially, the regions that are most in need of economic development and sustainable growth, including sub - Saharan Africa, depend most heavily on women for household chores and work. (UNICEF and WHO, 2012). The difficulty of fetching water thus continues to be a significant barrier to household water security and sustainable development, particularly for rural women in middle and low - income regions.

3.1 Water Security and Maternal Health Outcomes

Increasingly, the adverse health effects of carrying water are recognized, and small - scale studies have been conducted to investigate these effects (Geere et al., 2010a; Evans et al., 2013; Geere, 2015). There have also been concerns about the risks to personal safety presented by several situations (House et al., 2014). Since women are primarily entrusted with providing water to households, their susceptibility to disease transmission and contraction is increased (WHO, 2011). According to Justoneafrica. org (2021), people down with water - related diseases take up half of the world's hospital beds. The health impacts of fetching water on women and their ability to work are likely to be more pronounced in low and middle - income countries, where a higher proportion of people engage in physically challenging, under - regulated, or poorly regulated work environments (Hoy et al., 2014). The most frequent task of women and girls in poor families is fetching water (Geere and Cortobius, 2017; Graham et al., 2016; Hopewell and Graham, 2014; WHO and UNICEF, 2017a), evident in poorer health outcomes for women and children among households with and without access to water (Geere et al., 2018; Pickering and Davis, 2012; Porter et al., 2012; Wang and Hunter, 2010), occurrences which may take place in several ways. Time and energy required for carrying water might also reduce women's opportunities to attend antenatal clinics (McCray, 2004), and this might result in the women missing out on important prenatal care (McCray, 2004); hospital/healthcare facility delivery is associated with attendance of antenatal clinics (Seraphin et al., 2015). In general, women who lack social support may be reluctant to spend time away from home in a healthcare facility to give birth and recover, particularly when they have very young children at home (Ono et al., 2013).

Fatigue and tiredness on the part of water carriers have been severally reported in other studies (JA Geere et al., 2010; JL Geere et al., 2010; Hemson, 2007; Porter et al., 2012; Zolnikov and Blodgett Salafia, 2016) as well as exposure to waterborne toxins (Gaspar et al., 2017; Guy et al., 2018) while Evans et al. (2013) showed that those carrying water spent less (40 minutes) time being inactive (such as sleeping, resting or watching television) than those without water. As a result, while a range of studies indicate that the energy expenditure related to water fetching may negatively impact pregnant women and mothers and that reducing the amount of work related to water transportation is likely to benefit them, other factors related to the infant or maternal nutrition should still be taken into account (Luby et al., 2018; Stewart et al., 2018) and availability of family planning services (Dangour et al., 2013) can affect under - five weight for age and stunting if perinatal or maternal health is negatively impacted. Other confounding factors attributable to the results could be food intake, nutritional status, feeding programs, birth rates, or illness affecting mothers. It has been suggested that insecurity over water contributes to emotional and psychological distress (Wutich, 2009; Stevenson et al., 2012; Diouf et al., 2014). Among the ways that stress affects health are disability resulting from musculoskeletal disorders, work performance, and satisfaction. Violence against women and abuse of children is not uncommon with water - fetching (Sorenson et al., 2011; House et al., 2014). In low - and middle - income countries where physical labour is more prevalent, informal work has become increasingly prevalent, and work regulations are weaker, the effects of fetching water may be more pronounced (Hoy et al., 2014). The effect of water insecurity on economies cannot be over - emphasized as it pushes the spending more on water purchases than on health and livelihood strategies. This can be noted in South - South Nigeria where pollution of water bodies has hindered water use and increased family expenditure. Sustainable water management is pinned on water security.

3.2 Women and Water Carriage Roles

Water - fetching impacts are often exacerbated by other household or personal factors that limit access to and carrying water and create inequalities in water security and livelihoods. According to the JMP (UNICEF and WHO, 2012), In sub - Saharan Africa, three - quarters of households get water from a source that is not near their home, and 71% of households place the primary responsibility for collecting water on women and girls. According to a JMP report, in 61 DHS and MICs surveys, 73.5% of households reported women as water collectors, and in 53 out of 73 countries, over 50% of households without water on premises depend on women for water supply (WHO, 2017). Further, it has been reported that the probability of a woman being the responsible person increases as trip duration increases (Sorenson et al., 2011). In other studies, the energy costs of fetching water have been characterized as moderate to high (Rao et al., 2007) and can provide an important factor in food - scarce environments (Domenech et al., 2012).

That water is primarily carried by women and children, particularly in rural areas and sub - Saharan Africa cannot be over - emphasized. Despite concerns, it is not clear how water carriage can be related to the health of the carrier. Several qualitative studies indicate a connection between water carriage and pain, fatigue, perinatal health problems, and violence against vulnerable people, and no conclusive evidence of associations with stress or self - reported mental health (Geere J. A. et al., 2018). The odds of a woman delivering in a healthcare facility are decreased when household members fetch water (Geere JL, & Hunter PR., 2020). Water supply costs in many homes are not included as expenditures, but this tends to take a toll on family finances and spending power in terms of time spent to collect water outside homes, money to buy vended water,

storage and rainwater harvesting costs, as well as treatment costs for water - related diseases.

3.3 Water Policy and Women's Empowerment

The SDGs are uniquely interconnected, particularly concerning accessing water, as the SDG 6 Synthesis Report (2018) reflects—"*Water resources are embedded in all forms of development (e. g., food security, health promotion, and poverty reduction), in sustaining economic growth in agriculture, industry and energy generation, and in maintaining healthy ecosystems*" (United Nations, 2018). They further inferred that the interconnections that occur among SDG 3, 5, and 6 also extend to other SDGs, including; labour markets (SDG 8), political participation (SDG 10), poverty (SDG 1), peaceful and inclusive societies (SDG 16). Despite this, a detailed understanding of the interlinkages between water and gender is lacking. To achieve SDGs 5 and 6, women's participation in water governance is very important. Studies have shown several factors hindering women's participation in leadership roles in water politics (Caruso et al., 2021; Mandara et al., 2017; Indarti et al., 2019). These factors are individualistic (women's marital status, religion, educational attainment, knowledge, age and social capital status) and relational (political affiliation, family support and influence, acceptance of women leaders by men) in nature. With the increasing impacts of climate change, the involvement of women in integrated water resources management is paramount as they ensure water decisions are reflective of the whole community (oxfam. org). Amazingly, women who bear the brunt of fetching water for family use are under - represented in positions of authority in the sector where water policies are made for better diagnosis and policymaking. Though, inclusion they say does not guarantee participation, voice, or decision - making power of the women folk; there is a need for improved communication and information management system between the government and the people.

4. Conclusion

An empowered woman is more aware of the challenges around her and forges ways individually or collectively to improve her livelihood. Furthermore, since health burdens associated with poor water and sanitation affect women disproportionately, the water - gender interrelationships with health need to be carefully examined and, subsequently, integrated into policies. Women who have been water keepers should not only be engaged in water entrepreneurship but also lend their voices in water policymaking for a more secured water future. They should be allowed to bring their wealth of significant indigenous knowledge regarding adaptation strategies to the climate change - related policy - making scenario.

For future research, I suggest that concerted efforts should go into developing approaches to extricating gender disparities and barriers to women's involvement in policymaking on water resource management for a sustainable environment.

References

[1] Caruso, Bethany & Conrad, Amelia & Patrick, Madeleine & Owens, Ajile & Kviten, Kari & Zarella, Olivia & Rogers, Hannah & Sinharoy, Sheela. (2021). **Water, Sanitation, and Women's Empowerment: A systematic review and qualitative meta - synthesis.1**0.1101/2021.10.26.21265535.

[2] Cook J, Kimuyu P, Whittington D (2016). **The cost of coping with poor water supply in rural Kenya.** Water Resources Research.

[3] Geere, J. A. & Cortobius M. (2017). **Who carries the weight of water? Fetching water in rural and urban areas and the implications for water security**. Water Altern. (WaA): 10 pp.513 - 540

[4] Geere J. A., Hunter P. R., & Jagals P. (2010). **Domestic water carrying and its health implications: a review and mixed methods pilot study in Limpopo Province, South Africa** Environ. Health, 9 (52). https: //doi. org/10.1186/1476 - 069X - 9 - 52

[5] Geere J. L., M. Cortobius M., J. H. Geere, C. C. Hammer, P. R. Hunter (2018). **Is water carriage associated with the water carrier's health? A systematic review of quantitative and qualitative evidence**. BMJ Glob. Health, 3 Article e000764

[6] Geere JL, Hunter PR (2020). **The association of water carriage, water supply, and sanitation usage with maternal and child health. A combined analysis of 49 Multiple Indicator Cluster Surveys from 41 countries.** Int J Hyg Environ Health; 223 (1): 238 - 247. DOI: 10.1016/j. ijheh.2019.08.007. Epub 2019 Sep 2. PMID: 31488359.

[7] Graham JP, Hirai M, Kim S - S (2016). **An Analysis of Water Collection Labor among Women and Children in 24 Sub - Saharan African Countries.** PLoS ONE 11 (6): e0155981. https: //doi. org/10.1371/journal. pone.0155981

[8] Grant, M. & Soeters, S. S. & Bunthoeun, I. V. & Willetts, J. (2019). **Rural Piped - Water Enterprises in Cambodia: A Pathway to Women's Empowerment?** Water.11.2541.10.3390/w11122541.

[9] Howard G, Bartram J (2003). **Domestic water quantity, service levels, and health. Geneva: WHO.**

[10] Hunter, P. R., MacDonald, A. M., Carter, R. C., (2010). **Water supply and health.** PLoS Med.7, e1000361.

[11] Indarti, N., Ostiani R, Megaw T, Willetts J (2019). **Women's involvement in economic opportunities in water, sanitation and hygiene (WASH) in Indonesia: Examining personal experiences and potential for empowerment.** *Development Studies Research*; **6** (1): 76 - 91.

[12] Mandara CG, Niehof A, van der Horst H (2017). **Women and rural water management: Token representatives or paving the way to power?** *Water Alternatives*; **10** (1): 116 - 33.

[13] Ono M., Matsuyama A., Karama M., Hond S. (2013). **Association between social support and place of delivery: a cross - sectional study in Kericho, western Kenya**. BMC Pregnancy Childbirth, 13, p.214

[14] OXFAM (2019). **World Water Day: how far would you walk for water?** Boston: Available from: https:

//www.oxfamamerica. org/explore/stories/world - water - day - how - far - would - you - walk - water/

[15] Pickering A. J. & Davis J. (2012). **Freshwater availability and water fetching distance affect child health in sub - Saharan Africa**. Environ. Sci. Technol., 46 pp.2391 - 2397

[16] Pickering AJ, Davis J, Walters SP, Horak HM, Keymer DP, Mushi D, et al. (2010). **Hands, Water, and Health: Faecal Contamination in Tanzanian Communities with Improved, Non - Networked Water Supplies.** Environmental Science & Technology 44: 3267–3272.

[17] Wang X, Hunter PR (2010). **A systematic review and meta - analysis of the association between self - reported diarrheal disease and distance from home to a water source.** Am J Trop Med Hyg 83: 582–584. pmid: 20810824

[18] WHO, UNICEF (2017). **Progress on Drinking Water, Sanitation and Hygiene: 2017 Update and SDG baselines**. World Health Organisation (WHO) and the United Nations Children's Fund (UNICEF), Geneva

[19] UN Women (2017). **Gender Equality and Water, Sanitation and Hygiene, Report of the Expert Group Meeting.** New York, NY. Available online at: http: //www.unwomen. org//media/headquarters/attachments/sections/news%20and%20events/stories/2018/expert - group - meeting - on - gender - equality - and - water - sanitation - and - hygiene - report - 2017 - 12 - en. pdf?la=en&vs=5541

[20] United Nations (2018). ***Sustainable Development Goal 6: Synthesis Report on Water and Sanitation.*** New York, NY. doi: 10.1126/science.278.5339.827