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To what extent does household infrastructure predict maternal health in Northern Nigeria? Findings from a cross-sectional study

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ABSTRACT

Previous studies have not sufficiently explored the association between household infrastructure and maternal health care use in Northern Nigeria, hence this study. Data on condition of household environment and maternal health care use were extracted from the 2018 Nigeria Demographic and Health Survey (NDHS). The Stata 14 was used to perform descriptive and inferential statistical analyses. Findings show that household infrastructure were significantly associated with antenatal care visit, place of delivery and assistance during delivery. Results further reveal that household infrastructure such as toilet facility, cooking fuel, and source of drinking water significantly predict maternal health in Northern Nigeria. Measures to improve maternal health in the region should include empowering people with ability not only to access healthcare, but also to improve their household infrastructure.

Keywords: Household, infrastructures, maternal health, Northern Nigeria

INTRODUCTION

Household infrastructures are physical networks providing support essential to house hold health condition. They include water supply, solid waste management, energy supply, and telecommunication and transportation facilities. In many Nigerian settlements particularly in rural areas, the household environment lacks basic and critical infrastructures needed to protect human health. Water for instance is available in virtually all Nigerian households. However, as posed by Ebiare and Zejiao (2010), the question is whether what is available is good enough for consumption. In several communities, water available for drinking is unsafe. Unsafe water has serious health consequences for household members including pregnant women and children. Studies have shown that a significant proportion of all infant mortality is linked to infectious and parasitic disease, most of them water-related. The health consequences of water- related diseases constitute a human tragedy, killing millions of people each year, preventing millions more from leading health lives, and undermining development efforts (Rowley, 1993; Nash, 1993; Olshemsky, Carnes, rogers and smith, 1997; Hinrichen, Robey, and Uphadhyay, 1998). Evidence also abounds that pregnant women can transmit some water-borne microbes, such as enter viruses, too unborn children (Physician for Social Responsibility, 2009).

As a result of increasing urbanisation in the country, a significant proportion of urban populations live in overcrowded informal human settlements designated as semi urban or slum. "Disease caused by unsanitary living conditions and the use of unsafe water are common health hazards of Nigerian cities resulting in diarrhea, cholera and typhoid. Many urinate in the open or nearby bushes, and food and water can be easily contaminated from exposure to human waste' (Mabogunje, 2007). Closely connected to water management infrastructure is waste disposal management exemplified by the type of toilet facility

available to members of households. 'the essence of toilet facility in the household is to provide a means of disposing potentially dangerous excreta such as excreta from children that are reported to be more hazardous' (Lucas and Giles, 2003) and to prevent the spread of vectors such as flies and mosquitoes that might breed in such waste. The common type of toilet facilities in many parts of the country is still the pit latrines, with its associated health problems. With the excursion of the ventilated improved pit latrines, the simple pit latrines are associated with presence of foul smell and thus, sustaining the spread of diseases such as diarrhea and malaria with serious consequences for maternal and child health (Lucas and Gilles, 2003).

Indoor air pollution is another household environmental hazard that results from household energy infrastructure. It increases the risk of disease and juries within the household. This results mainly from the type of cooking fuel available to the household. In all parts of Nigeria, many families still cook and heat their homes using open fires and leaky stoves burning solid fuel such as wood, charcoal, animal dung and crop waste. Such cooking practices produced high levels of indoor air pollution which negatively affects human health. Studies have shown that this type of domestic energy do not burn cleanly and it emit large amounts of smoke, especially when use directly inside dwelling without adequate ventilation. This exposes women including pregnant women and young girls saddled with cooking responsibilities to chemical pollutants (Bruce, Prez-Padila, & Albalak, 2002; Ezzati & Kammen, 2002). Nearly 2 million people die prematurely from illness attributable to indoor air pollution from household solid fuel use. More than 1 million people a year die from chronic obstructive respiratory diseases that develop due to exposure to such indoor air pollution (WHO, 2011).

The differentials in infrastructure in the households, are not only associated with the socio economic condition of households, they are also associated with maternal and child health (Adekola, Allen, & Akintunde, 2014; Sialubanje, Massar, Hamer, and Ruiter, 2017; Theall and Johnson, 2017). Several health policies and strategies for improving maternal health has been developed and implemented across the two regions in the country. These include: national health policy (1988, revised in 2004); national reproductive health policy and strategy (2001); health sector reform programme (2004); the roadmap for accelerating the achievement of MDGS related to maternal and newborn health (2006); and the current integrated maternal, newborn and child health strategy (IMNCH) which was launched in 2007 (FMOH, 2011). In spite of the implementation of these policies, maternal health in Nigeria remain one of the poorest in the world because virtually all the policies target improving access to interventions without taking cognisance of the need to improve household settings which directly affect daily health living. Disparities in maternal health status across the country results not only from the different abilities of households to access healthcare, but also from different household conditions that may not be unconnected with the kind of infrastructure available to household members. This study thus examines the extent to which household infrastructure predict maternal health in Northern Nigeria. The region was selected for the study because it has the poorest maternal health indicators in the country (National Population Commission [NPC] & ICF, 2019)

METHODS

The study was conducted in the Northern region of Nigeria. A cross-sectional descriptive design involving the use of quantitative data was employed. Data on household condition and maternal health were extracted from the 2018 Nigeria Demographic and Health Survey (NDHS) which is

the most recent national estimate of demographic characteristics in the country. The analyzed data was based on the weighted sample of 16,456 women. Some of the variables were recoded. Toilet facility was regrouped into improved and non-improved facility. The improved toilet facility included flush to: piped sewer system; septic tank; and pit latrine, composting toilet, pit latrine with slab and ventilated pit latrine. The non-improved toilet facility consists of facilities that: flush to somewhere else; flush to don't know where; and pit latrine without slab, bucket toilet, hanging toilet and no toilet facility. Cooking fuel was regrouped into solid fuel and non-solid fuel. Solid fuel included: coal; charcoal; wood; straw/shrubs/grass; animal crop and animal dung. Non solid fuel included: electricity; kerosene; biogas; and natural gas. Similarly, source of drinking water was regrouped into improved and non-improved. The improved source consists of: piped; public tap/ stand pole; tube well/ borehole; protected well/ spring; and rainwater. The non-improved source included: unprotected well/ spring; tanker; cart with small tank; bottled water; and river/ dam/ lake/pond, stream, canal/irrigation. Household energy infrastructure was recoded into access to electricity or no access to electricity. Maternal health was measured by antenatal care, place of delivery and skilled assistance during delivery. Statistical analysis was performed to test the following hypotheses: toilet facility does not predict maternal health; cooking fuel does not predict maternal health; source of drinking water does not predict maternal health; and access to electricity does not predict maternal health.

RESULTS

The socio-demographic characteristics of the respondents are presented in Table 1. The majority of the respondents (61.8%) have no formal education. Less than one-fifth of the respondents completed either a primary or secondary education. More than half of the women (58.7%) who are in the highest wealth group. More than two- thirds of the respondents (75.7%) resided in rural

areas compared with less than a quarter (24.3%) who resided in urban areas. More than one-third of the respondents (41.4%) are not working as at the time of the survey.

Table 1: Socio-demographic profile of respondents

Characteristic	Frequency	Percentage
Maternal education		
None	10,167	61.8
Primary	2721	16.1
Secondary	2922	17.8
Higher	645	3.9
Household wealth index		
Lowest	9652	58.7
Middle	3095	18.8
Highest	3709	22.5
Place of residence		
Urban	3991	24.3
Rural	12466	75.7
Occupation		
Unemployed	6810	41.4
Professional	321	1.9
Clerical	63	0.4
Sales	4517	27.4
Agriculture	2748	16.7
Services	270	1.6
Skilled manual	1691	10.3
Unskilled manual	37	0.2
Age at first marriage		
14 or less	5459	38.5
15-24 years	8232	58.0
25-34 years	481	3.4
35 +	22	0.1
Age at first birth		
14 or less	1709	13.3
15-24 years	10288	79.8
25-34 years	862	6.7
35 +	32	0.2
Total	16,456	100

More than one-third of the respondents (38.5%) married at ages less than fourteen years. However, more than two-third of the women (79.8%) were ages 15-24 years at first birth. Slightly more than one tenth of the respondents (13.3%) were less than fourteen years as at their birth. These feature

indicate that the women are mainly rural based, poorly educated and of low economic status. Distributions of respondents by selected household infrastructure are shown in Table 2. Nearly equal proportions of the households had access either to improve on non-improved toilet facility. Majority of the households (93.7%) uses solid fuel as basic energy for cooking. More than half of the households (54.7%) had access to only non-improve source of drinking water. Nearly two-third of the households (68.1%) does not have access to electricity.

Table 2: Distribution of respondents by Household Infrastructure

Infrastructure	Frequency	Percentage
Toilet Fertility		
Improved	8149	49.5
Non improved	8307	50.5
Cooking Fuel		
Solid	15420	93.5
Non solid	1037	6.3
Source of drinking water		
Improved	7448	45.3
Non improved	9009	54.7
Access to electricity		
Yes	10876	66.1
No	5581	33.9
Main floor material		
Earth, sand	9080	55.2
Wood/planks	150	0.9
Ceramic/cornet	1080	6.6
cement	6147	37.3
Main wall material		
No wall	1873	11.4
Clay/mud/wood	8446	51.4
cement	6115	37.2
Has car/truck		
No	15244	92.6
Yes	1212	7.4

The physical condition of the households leaves much to be desired. The dominant main floor material in more than half of the households (55.2%) was earth/sand. Majority of the households (92.6%) had no car or truck or any viable means of transportation.

The bivariate results are presented in Table 3. Toilet facility was significantly associated with antenatal care, place of delivery and assistance during delivery. The hypothesis that toilet facility is not significantly associated with maternal health indicators was therefore rejected at the 5% level of significance. As shown in the table, cooking fuel was significantly associated with antenatal care, place of delivery and assistance during delivery. The hypothesis that cooking fuel is not significantly associated with maternal health indicator was therefore rejected at the 5% level of significance. Source of drinking water and maternal health were cross tabulated as shown in the table. Result of the chi-square test performed at 5% level of significant show that source of drinking water was significantly associated with antenatal care, place of delivery and assistance during delivery. The hypothesis that source of drinking water is not significantly associated with maternal health indicator was therefore rejected at the 5% level of significance. Access to electricity was cross tabulated with maternal health indicators as shown in the table. Result of the chi-square test performed at 5% level of significance reveal that access to electricity was significantly associated with access to electricity.

Table 3: Association between household infrastructure and maternal health

Characteristic	Antenatal care Skilled Unskilled	Place of delivery Facility Others	Birth attendant Skilled Others
Toilet Facility			
Improved	2350(470) 2652(530)	1057(21.1) 3946(78.9)	1156(23.1) 3847(76.9)
Non improved	2000(38.1) 3248(61.9)	843(16.1) 4406(839)	901(17.2) 4348(82.3)
Statistic	χ^2=133; p<0.05	χ^2=101; p<0.05	χ^2=122; p<0.05
Cooking Fuel			
Solid	3915(40.0) 5879(60.0)	1564(16.0) 8229(84.0)	1703(17.4) 8091(82.6)
Non solid	437(95.2) 22(4.8)	335(73.1) 123(26.9)	355(77.4) 104(22.6)
Statistic	χ^2=1220; p<0.05	χ^2=1.221; p<0.05	χ^2=1200; p<0.05
Source of water			
Improved	2205(50.1) 2199(499)	1102(250) 3301(75.0)	1176(26.7) 3228(73.3)
Non improved	2147(36.7) 3702(63.3)	797(13.6) 5051(86.4)	882(15.1) 4966(84.9)
Statistic	χ^2=230; p<0.05	χ^2=280; p<0.05	χ^2=278; p<0.05
Access to electricity			
Yes	2061(66.0) 1064(34.0)	1069(34.2) 2057(65.8)	1160(37.1) 1966(62.9)
No	2290(32.0) 4836(68.0)	830(11.7) 6296(88.3)	898(12.6) 6228(87.4)
Statistic	χ^2=1100; p<0.05	χ^2=956; p<0.05	χ^2=1.100; p<0.05

The multivariable results are presented in Table 4. Women in households with improved toilet facility had higher likelihood of improve maternal health indicators in all the models (odds ratio= 1.1855 in Model 1, 1.3909 in Model 2 and 1.3279 in Model 3). Women in households using solid fuels had less likelihood of an improved maternal health indicator in all the models (odds ratio=0.1610 in Model 1, 0.2443 in Model 2 and 0.2095 in Model 3). Women in households with non-improved source of water had less likelihood of improved maternal health indicator in all the models (odds ratio= 0.9819 in Model 1, 0.8748 in Model 2and 0.9059 in Model 3). Women in households with access to electricity had higher likelihood of improved maternal health status than households with no access to electricity in all models (odds ratio=1.7893 in Model 1, 1.4986 in Model 2 and 1.6051 in Model 3).

Table 4: Odds Ratio (OR) from logistic regression model examining association of household infrastructure with maternal health indicators in Northern Nigeria

Variation	Model 1	Model 2	Model 3
	OR	OR	OR
Toilet facility			
Non-improved (RC)	1.0000	1.0000	1.0000
improved	1.1855*	1.3909*	1.3279*
Cooking fuel			
Non solid fuel (RC)	1.0000	1.0000	1.0000
Solid fuel	0.1610*	0.2443*	0.2095*
Water source			
Improved (RC)	1.0000	1.0000	1.0000
Non- improved	0.9819**	0.8748**	0.9059**
Electricity			
No access	1.0000	1.0000	1.0000
Access	1.7893*	1.4986*	1.6051*

Notes: RC= Reference category. *p<0.01, **p<0.05

DISCUSSION

The study found that maternal health in Northern Nigeria is significantly associated with household infrastructure. The relevance of the association between maternal health and household infrastructure to improving maternal health has not been given due recognition in the health policies and strategies so far implemented in the country. All the policies including the

current IMNCH are usually organize to require either a skilled or unskilled health worker to administer the care. Maternal health interventions in the country should be repositioned to provide health workers not only with the opportunity of assessing the conditions of household infrastructure, but to also provide household members with appropriate suggestions on how to improve maternal health in the context of existing household infrastructure. One way of achieving this is the inclusion of routine home visits as part of the implementation strategies of maternal health programmes.

This study found that toilet facilities in most of the households are not safe for the health of mothers and newborns. A renewed drive for public health education is therefore required in the region. Public health education should specially emphasis the need for standard toilet facilities to be constructed in all household. This should be located at a safe place to avoid contaminating household source of drinking water. As found in the study, most households in the region only had access to non-improved source of drinking water. This implies that actions must be scaled up to provide households with clean and safe water infrastructure. This will help protect the citizenry from the harmful effects of poor water as noted in previous studies.

The study also found that the types of cooking fuel available to most households in Northern Nigeria are those potentially hazardous to human health. The dominant type found in the study is solid fuel which not only increase the risks associated with indoor air pollution, but also contribute to gradual depletion of forest reserves in the country. It is therefore important that steps be taken by the northern states governments and other health partners not only to educate the public on the long term health effects of solid fuels, but to also promote alternatives to the fuel wood.

One important action needed to reposition households in Northern Nigeria is economic empowerment. As found in the study, majority of the women sampled are in the lowest wealth categories, living in poorly constructed houses with very low educational attainment. These socio-economic factors adversely affects maternal and child health in the region. There is dire need for economic empowerment in the region. Empowerment begin with the provision of public education that ensures that both the boy-child and the girl-child are able to attend schools up to secondary education level, and the provision of viable means of live hood. It is important to note that serious measures to improve maternal health in Northern Nigeria must involve empowering people with ability not only to access healthcare, but also to improve their household conditions, in order to reduce the incidence and spread of illness and disabilities in the population.

CONCLUSION

The study examined the extent to which household infrastructure predict maternal health in Northern Nigeria. Data were extracted from the 2018 NDHS. Findings reveal that household infrastructures such as electricity, toilet facility, source of drinking water and cooking fuel are not only significantly associated with measures of maternal health, they also significantly predict the state of maternal health. These findings suggest that measures to improve maternal health in Northern Nigeria should not only seek the expansion of maternal health care in the region but should also pay attention to improving household living conditions.

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