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AN EVALUATION OF ENVIRONMENTAL AND CULTURAL FACTORS AFFECTING UNDER-FIVE MORTALITY IN KEBBI STATE, NIGERIA

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ABSTRACT: *Over the years, Nigeria at all levels of government has formulated and implemented health policies and programmes to reduce under-five mortality; and despite that, it is still among Sub-Saharan Africa countries with high under-five mortality rate. This study aimed at evaluating environmental and cultural factors affecting under-five mortality in Kebbi State, Nigeria. Multi-stage sampling technique was used to sample respondents. Structured questionnaires were administered to 625 women aged 15-49 years and 603 were retrieved, giving the response rate of 96.5%. Descriptive statistics such as frequencies and percentages were employed to analyse the characteristics of the respondents and distribution of under-five mortality experienced by women based on the environmental and cultural factors. Logistic regression analysis was applied to determine the environmental and cultural factors affecting under-five mortality in the study area. The results of the Logistic regression analysis revealed that at P-value <0.05, source of water, frequency of washing water container, water treatment, method of disposing waste water, type of toilet, shared toilet, frequency of washing toilet, method of disposing child's stool, type of cooling appliance, number of persons per room, use of mosquito net, refuse disposal method and type of cooking fuel were found to be the environmental factors significantly affecting under-five mortality; while ethnicity, religion, practice of food taboo, belief in traditional medicine, belief about disease causation, mother's autonomy on child's health and family's decision on child's health were found to be the cultural factors significantly affecting under-five mortality in the study area. The study therefore concluded that environmental and cultural factors affect under-five mortality in Kebbi state. To reduce under-five mortality rate, it was recommended that government at all levels should step up efforts in providing adequate infrastructure for public use. Government and cultural organizations should mount advocacy programmes aimed at improving women's participation in child's health decision-making in the family.*

KEYWORDS: Environmental Factors, Cultural Factors, Under-five Mortality, Kebbi State, Nigeria

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INTRODUCTION

Under-five mortality rate globally dropped from 90 deaths per 1,000 live births in 1990 to 48 deaths per 1,000 live births in 2012 (UN, 2013). Similarly, under-five mortality which was estimated to be 12.6 million in 1990 reduced to 5.3 million in 2018 (WHO, 2019). However, despite the global progress in under-five mortality reduction over the years, it has not been even at regional levels. Childhood mortality estimates by regions revealed that industrialized nations have the lowest. For instance, in 2015, Sub-Saharan Africa recorded 85% child mortality, being the highest, Oceanic (51%), South Asia (33%), South East Asia (27%), North America (24%), Western Asia 23%, Latin America and the Caribbean 17% and Eastern Asia 11% (UNDP and UNRISC, 2017). Sub- Saharan Africa under-five mortality has been reported to be 10-fold of the industrialized countries, carrying about half of the world's under-five deaths in 2015 (United Nations, 2015). Estimates of percentage reduction change of childhood mortality in Sub-Saharan Africa was 52% which was lower than that of Eastern Asia (78%), Latin America (69%) and North America (67%) (UNDP and UNRISC, 2017). In 2018, 1 in 13 children in Sub-Saharan Africa die before their fifth birthday, which is 15 times higher than the risk a child faces in Europe, where just 1 in 196 children aged less than five die (WHO, 2019).

Progress in under-five mortality reduction has been witnessed in Nigeria, but not significant enough when compared with some low-income and middle-income countries. For instance, between 1990 and 2000, Nigeria child mortality rate was estimated to be high, while countries like Bangladesh, Ethiopia, Liberia, Malawi, Nepal, United Republic of Tanzania have already lowered their rates by two-third (United Nations, 2013). The under-five mortality rate in Nigeria experienced a rise from 128 deaths per 1,000 live births in 2013 to 132 deaths per 1,000 live births in 2018 ((NPC and ICF International, 2019). Surprisingly, Nigeria and India in 2018 alone were reported to have accounted for about a third of children's deaths in the world; placing Nigeria among countries with the highest under-five mortality (World Health Organization, 2019). Reduction in under-five mortality rates in Nigeria has not even among the regions. For instance, Multiple Indicator Cluster Survey (MICS) 2017 showed that North West recorded the highest under-five mortality rate of 162 deaths per 1,000 live births, compared to North Central (103), North East (115), South East (67), South South (59) and South West (67). Similarly, Nigeria Demographic and Health Survey of 2018 reported under-five mortality rate of 187 deaths per 1,000 live births for North West Zone, which was higher than that of North Central (95), North East (134), South East (75), South South (73) and South West (62). Responding to unacceptable under-five mortality rate, various child health policies and programs have been launched in the country.

One of the initiatives is the National Child Health Policy of 2006 that provided long term direction for protecting and promoting the health of children. In 2007, to provide a framework to guide the federal, states and local government health planning process, National Strategic Health Development Plan was initiated. Within the framework of National Health Policy, National Reproductive Health Policy Strategy was created in 2001 to uphold Primary Health Care (PHC) as the key to health development in Nigeria. Other efforts included the National Health Policy which was launched in 2016 and 2nd National Strategic Health Development Plan, 2017-2021. Health Financing Policy and Strategy, 2017 was also formulated to regulate financing of Health sector. The National Routine Immunization Strategic Plan (NRISP), 2013-2015 was initiated to combat childhood killer diseases. In 2012, Nigeria government launched Saving One Million Lives, which was aimed at achieving

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the Millennium Development Goal of reducing child mortality by two thirds before 2015 through expanding primary health services to women and children (United Nations, 2013). Other initiatives targeted at reducing child mortality included Exclusive breast-feeding, Helping Babies Breathe, Kangaroo Mother Care, Making Pregnancies Safer (MPS), Baby Friendly Hospital Initiative (BFHI), Nigeria's Midwives Service Scheme, Safe Motherhood initiative, Roll Back Malaria Initiative (RBM), elimination of Iodine Deficiency Disorder (YDD), Vitamin A Deficiency Control and Integrated management of Childhood Illness (IMCI).

Previous studies carried out have found environmental and cultural factors to be predictors of childhood mortality. Kandara *et al*. (2007) and Ayotunde *et al*. (2009) have found environmental factors to be influential in childhood mortality in Nigeria. Other studies included that of Edeme *et al*. (2015) and Adeolu *et al*. (2016) that found environmental factors to be determinants of under-five mortality in Nigeria. Also, household environmental factors such as source of water, toilet type, child's stool disposal method and use of bed net were found to be significantly related to child morbidity in Nigeria (Fasina, 2015). Adebowale *et al* (2017) and Jacob *et al* (2011) found housing materials to be associated with under-five mortality. On cultural factors, Yildiz (2018) observed that cultural practices of families are directly related to children's health, particularly on perception of illness, reaction to illness and therapy. Fayehun and Omololu (2011) found ethnic groups in Northern Nigeria to have the highest risk of child mortality. Bhalotra (2010) on effect of Religion on child health in India revealed Muslims exhibition of lower son preference, resulting to gender bias on childhood mortality. Although, these previous studies might have contributed to the understanding of environmental and cultural factors affecting under-five mortality in Nigeria and elsewhere; however, to the best of researchers' knowledge, they are still scanty in Kebbi state. Importantly, information from this present study would be useful in formulating health policies to reduce under-five mortality in Kebbi state and Nigeria at large.

Study Area

Kebbi State is located between latitude 10^0N and 13^0N and Longitude 3^0 E and 6^0 E. It lies at the extreme North West Corner of Nigeria. The state shares international borders with Benin Republic and Niger Republic in the North and West respectively. In Nigeria, Kebbi State shares borders with Niger State in the south and in the East with Sokoto and Zamfara States. It lies approximately at 700m above sea level, enjoying tropical continental type of climate mainly controlled by two air masses, tropical maritime and tropical continental, blowing from Atlantic and Sahara Desert. The vegetation consists of partly that of northern guinea savannah and the Sudan savannah. In the northern guinea savannah, they are characterized by trees like, locust bean trees, shear butter trees and combretum species. In the northern part of the state, the Sudan savannah consist of open wood land with scattered trees such as acacia and dump palms. The state has a projected population of 4,440,000 in 2016 (National Bureau of Statistics and National Population Commission, 2010).The following tribes exist in the state: Hausas (dominant in Birnin-Kebbi, Argungu and Jega); Fulanis (dominant in Bunza, Dakin Gari and Gwandu); Kambari (dominant in Yauri and Ngaski); Dakarikari (dominant in Zuru, Danko and Sakaba) and Zabarmawa (dominant in Dandi and Illo)

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Theoretical Framework

Mosley and Chen analytical framework of 1984 was used as a guide for this study. The model postulated that all social and economic factors do not operate alone, but through what they referred to as proximate determinants to influence child survival or mortality. The major assumption of the model is that in an optimal setting, over 97% of new born infants can be expected to survive through the first five years of life. Reduction in this survival probably in any society is due to the operation of socio-cultural, economic, biological and environmental factors. The model further maintained that maternal factors that may influence child's survival are age, parity, child weight, birth interval, among others. Nutrient deficiency factors include calories intake, proteins, vitamins and minerals. Environmental factors include air pollution, food contamination, fingers and inmate objects, among others. Health seeking behavior factors are personal preventive measures, seeking medical attention, antenatal attendance and immunization, while injury could be accidental or intentional in a child. According to the model, these factors may cause morbidity; and if proper medical attention is not given, it may result to child mortality. This present study applied the model to determine the effect of environmental and cultural variables (independent variables) on under-five mortality (dependent variable) in Kebbi State respectively.

METHODOLOGY

Research Design

Cross- sectional survey research design was used in this study. The population of this study was all women aged 15-49 years. The data for the study consisted of both primary and secondary sources which included structured questionnaire, National Population Commission census data, textbooks, journals and internet materials. Multi-stage sampling technique was employed to sample respondents. In the first stage, two (2) Local Government Areas in the state were sampled. Birnin-Kebbi LGA was purposively selected based on its uniqueness as the state capital and also better disposed in terms of social amenities. To ensure that the remaining 20 LGAs were given equal chance of being included in the study, table of random numbers was used and Koko-Besse LGA was selected. In the second stage, for adequate representation and spatial distribution of sampling units, 30% of the wards were randomly selected in each of the two LGAs using table of random numbers. In the third stage, using the 2006 Census Locality and Enumeration Area list, 30% settlements were selected in each of the wards using table of random numbers. The 141,326 total population of women aged 15-49 years for the selected LGAs was estimated using 3.1% Kebbi state population growth rate of 2006 census; and Yamane (1967) formula was then used to determine 625 sample size for the study. Yamane formula is widely used by researchers and has been adjudged to be simple, including its ability to determine sample size of both continuous and categorical survey variables (Isreal, 1992; Sarmam *et al*.; 2013, Islam, 2018). The sample size was therefore calculated as shown below:

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$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = Sample size required

N = the population size

e= Margin of error (4 %) at 95 % confidence level.

$$n = \frac{141,326}{1+141,326(0.04)^2}$$

$$= \frac{141,326}{141,327 \times 0.006}$$

$$= \frac{141,326}{226.12} = 625$$

Out of 625 questionnaires administered to the women, 603 were retrieved and used, giving a response rate of 96.5%. Summary of the number of selected wards, settlements, households and the sample size in each LGA are shown in Table 1.

Table 1: Number of Selected Households and Sample Size in Each of the Selected LGAs

L.G.A	No. of Selected wards	No. of selected settlements	No. of Households in Selected settlements	Sample Size
Birnin-Kebbi	5	21	8,243	368
Koko/Besse	4	12	3,874	257
Total	9	33	12,117	625

Source: Field Survey, 2018

Data Analysis

SPSS 23 environment was used to analyze the data. Descriptive statistics such as frequencies and percentages were employed to analyze the demographic and socio-economic characteristics of the respondents. Cross-tabulation, involving frequencies and percentages were used to analyse the under-five mortality experience based on the environmental and

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cultural factors. Logistic regression analysis was used to determine the environmental and cultural factors affecting under-five mortality in the study area, using < 0.05 as the p-value.

RESULTS AND DISCUSSION

Demographic and Socio-economic Characteristics of the Respondents

Table 2 presents the descriptive analysis of the demographic and socio-economic characteristics of the respondents.

Table 2: Distribution of Demographic and Socio-economic Characteristics of the Respondents

	Characteristics	Frequency	Percentage
Variable Category			
Age group (Years)	15 – 20	66	10.9
	21 – 24	143	23.7
	25 – 29	62	10.3
	30 – 34	132	21.7
	35 – 39	129	21.4
	40 – 44	46	7.9
	40 – 49	25	4.1
	Total	**603**	**100.0**
Marital Status	Single	25	4.1
	Married	518	85.9
	Widowed	40	6.6
	Divorced	16	2.7
	Separated	04	0.7
	Total	**603**	**100.0**
Educational Attainment	No Formal Education	238	39.47
	Primary	240	39.80
	Secondary	75	12.44
	OND/NCE	10	1.66
	Degree/HND	32	5.31
	Post Graduate	08	1.32
	Total	**603**	**100.0**
Ethnicity	Hausa	487	80.8
	Igbo	03	0.5
	Yoruba	40	6.6
	Kambari	14	2.3
	Fulfude	16	2.7
	Dakarkari	31	5.1
	Others	12	02
	Total	**603**	**100.0**
Religion	Christianity	78	13
	Islam	524	86.8
	Traditional religion	01	0.2
	Total	**603**	**100.0**
Occupation	Civil servant	11	1.8
	Trading/Business	203	33.7
	farming	08	1.3
	Housewife	365	60.5
	Others	16	2.7
	Total	**603**	**100.0**

Source: Field Survey, 2018

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A total of 603 women aged 15-49 years were interviewed using structured questionnaires. Out of 603 respondents, 215 (35.7%) of them indicated to have experienced under-five deaths within 5 years preceding this survey. The mean age of the women was 30 years, with majority of the respondents (23.7%) in the age group 21-24 years, while the age group 45-49 had the least respondents of 4.1%. The results further indicate that 85.9 % of respondents were married, 4.1 % of them single; while widows and divorcees were 6.6 % and 2.7 % respectively. The respondents with primary education constituted the highest respondents with 39.80%, while those with post-graduate qualification were the least, constituting 1.33 %. Respondents that were Hausas constituted 80.8%, being the majority and the least respondents (0.5%) were Igbos. The respondents (86.8%) that practice Islam were the majority, while Traditional religion worshipers were the least with 0.2%. The results also show that 60.5 % of the respondents were housewives and those that were into trading/businesses were 33.7%. Civil servants and farmers constituted 1.8% and 1.3% respondents respectively, while 2.7 % were into other occupations.

Environmental Factors and Under-five Mortality Experience

Table 3 shows that under-five mortality experienced by women that source water from river/stream was 28.4%, while those that source water from tap experienced the least under-five mortality (3.7%). Under-five mortality (66 %) was occurred among women that do not treat water, while 34% was experienced by the respondents that treat water. The results also revealed that women that store water in rubber drum/bucket/jerry can without cover experienced more under-five mortality (49.8%), while low under-five mortality (0.5%) occurred among women that use rubber drum/jerry can with cover. Under-five mortality (42.8%) was recorded by women that wash water storage container weekly, with only 5.1% recorded by women that wash water container daily. The respondents that dispose waste water into open field experienced more under-five mortality (58.2%), while the least (5.6%) was experienced by women that use open drainage channel to dispose waste water. More under-five mortality (37.2 %) occurred among women that use open pit without cover as toilet, while those that use water system with cover experienced only 8.4% under-five mortality. The study further revealed that 62.3% under-five mortality was experienced by women that share toilet facility, while less under-five mortality (37.7%) occurred among women that do not share toilet.

Women that wash toilet weekly experienced 36.7% under-five mortality, with only 16.7% under-five mortality experienced by women that wash toilet daily. Women that dispose child's stool at the backyard experienced the highest under-five mortality of 28.4%, while those that flush child's stool with water experienced the least under-five mortality of 8.4%. Under-five mortality (51.6%) was experienced by women that dump refuse at the backyard, against 11.6% under-five mortality by women that dump refuse in the stream/ river.

The results in Table 3 also show that 35.8 % under-five mortality occurred among women that live in single room, while those that live in story building recorded the least under-five mortality of 4.7%. Women that live in thatch roofed house experienced the highest under-five mortality (41%), while those that live in stone coated sheet house experienced the least under-five mortality (8%). Under-five mortality (37.2%) occurred among women that live in earth/mud floor house, while those that live in a house floored with other materials recorded the least under-five mortality (9.4). Under-five mortality (10.3%) was experienced by women

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that live in a house with one window, while the highest under-five mortality (40.9%) occurred among women that live in a house without window.

Table 3: Distribution of Under-Five Mortality by Environmental Factors

	Ever lost under-five				
	Yes		No		
Variables	No	%	No	%	Total (%)
Source of water					
Uncovered well	56	26	122	31.4	178(29.5)
Covered well	16	7.4	21	5.4	37(6.1)
Manual/Motorized borehole	20	9.3	03	0.8	23(3.8)
Water vendors	27	12.6	100	25.8	127(21.1)
River/stream	61	28.4	120	30.9	181(30)
Tap	08	3.7	02	0.5	10(1.7)
Others	27	12.6	20	5.2	47 (7.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Water treatment practice					
Yes	73	34	246	63.4	319(52.9)
No	142	66	142	36.6	284(47.1)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of water storage container					
Rubber drums without cover	103	47.9	128	33	235(38.9)
Clay pot	65	30.2	97	25	162(26.9)
Metal tank	12	5.9	36	9.3	51(8.5)
Rubber drums with cover	16	7.1	76	19.6	98(16.3)
Rubber tank	09	4.2	20	5.2	21(3.5)
Others	05	4.7	31	7.9	36(5.9)
Total	**215**	**100**	**388**	**100**	**603**(100)
Frequency of washing water container					
Daily	11	5.1	80	20.6	91(15.1)
Twice a week	36	16.7	24	6.2	60(9.9)
Weekly	92	42.8	147	37.9	239(39.3)
Twice a month	16	7.4	67	17.3	83(13.8)
Monthly	60	28	70	18	130(21.6)
Total	**215**	**100**	**338**	**100**	**603(100)**
Method of waste water disposal					
Open drainage channel	12	5.6	69	17.8	81(13.4)
Infiltration pit	13	06	50	12.4	63(10.4)
Open field	125	58.2	154	39.7	279(46.7)
Simple pit	29	13.5	63	16.2	92(15.3)
Others	36	16.7	52	13.4	88(14.6)
Total	**215**	**100**	**388**	**100**	**603(100)**
Shared toilet					
Yes	134	62.3	79	20.4	213(35.3)
No	81	37.7	309	79.6	390(64.7)
Total	**215**	**100**	**388**	**100**	**603(100)**

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Type of toilet facility					
Open pit without cover	80	37.2	105	27. 1	85(30.7)
Open pit with cover	25	11.6	63	16.2	88(14.6)
Water system without cover	38	17.7	61	15.7	99(16.4)
Water system with cover	18	8.4	84	21.4	102(16.9)
Others	54	25.1	75	19.3	129(21.4)
Total	**215**	**100**	**388**	**100**	**603(100)**
Frequency of washing toilet					
Daily	35	16.3	81	20.9	116(19.2)
Twice a week	28	13	90	23. 1	18(19.6)
Weekly	79	36.7	102	26. 1	81(30)
Monthly	73	34	115	29.6	188(31.2)
Total	**215**	**100**	**388**	**100**	**603(100)**
Method of child's stool disposal					
Flush with water	18	8.4	92	23.7	110(18.2)
Pour at the backyard	61	28.4	81	20.9	142(23.5)
Cover with sand	50	23.3	90	23.2	140(23.2)
Pour in a pit latrine	40	18.6	100	25.8	140(23.2)
Others	46	21.3	25	6.4	71(11.9)
Total	215	100	388	100	603(100)
Method of dumping refuse					
At the backyard	111	51.6	131	33.8	242(40.1)
Stream/River	25	11.6	104	27	129(21.4)
Community refuse pit	49	22.8	124	32	173(28.7)
Other	30	14	29	7.2	59(9.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of living house					
Single room	7	35.8	66	17	143(23.7)
Room /Parlour	63	29.3	31	8.0	94(15.6)
Bungalow	41	19	167	43	208(34.5)
Duplex	24	11.2	99	26	123(20.4)
Story building	10	4.7	25	6.0	35(5.8)
Total	**215**	**100**	**388**	**100**	**603**(100)
Type of roofing materials					
Stone coated sheet	13	06	61	15.7	74(12.3)
Thatched roofing	88	41	93	24.0	181(30)
Corrugated zinc sheet	47	21.9	86	22.2	133(22.1)
Asbestos sheet	39	18.1	87	22.4	126(20.8)
Others	28	13	61	15.7	89(14.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of floor					
Earth /mud	80	37.2	108	27.8	188(31.2)
Gravel	42	19.5	81	20.9	123(20.4)
Cement	48	22.3	100	25.2	148(24.8)
Tiles	25	11.6	48	12.4	73(12.1)
Others	20	9.4	51	13.1	71(11.8)
Total	**215**	**100**	**388**	**100**	**603(100)**

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No of windows per room					
1	88	40.9	144	37.1	232(38.5)
2	67	31.1	138	35.6	205(33.9)
3	38	17.7	70	18	108(17.9)
None	22	10.3	36	9.3	58(9.7)
Total	**215**	**100**	**388**	**100**	**603(100)**
Number of persons per. Room					
1-2	39	18.1	110	28.3	149(24.7)
3-4	26	12.2	81	20.9	107(17.7)
5-6	56	26	99	25.5	155(25.8)
7 above	94	43.7	98	25.2	192(31.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of cooling appliance					
Air Conditioner	20	9.3	103	26.5	123(20.4)
Table Fan	55	25.6	104	26.8	159(26.4)
Ceiling Fan	60	28	92	23.8	152(25.2)
None	80	37.1	89	22.9	169(28)
Total	**215**	**100**	**388**	**100**	**603(100)**
Use of mosquito net					
Yes	92	42.8	234	60.4	326(54.1)
No	123	57.2	154	39. 6	277(45.9)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of cooking fuel					
Electricity	07	3.3	51	13.1	58(9.6)
Gas	10	4.7	54	13.9	64(10.6)
Kerosene	11	5.1	57	14.7	68(11.3)
Charcoal	60	27.9	61	15.8	121(20.1)
Wood	71	33	91	23.5	162(26.9)
Animal Dugs	31	14.4	70	18	101(16.7)
Others	25	11.6	04	01	29(4.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Type of animal domesticated					
Dog	35	16.3	71	18.3	106(17.6)
Cat	20	9.3	48	12.4	68(11.3)
Cattle	46	21.4	70	18	116(19.2)
Sheep/Goat	63	29.3	90	23.2	153(25.4)
Birds	25	11.6	60	15.5	85(14.1)
None	26	12.1	49	12.6	75(12.4)
Total	**215**	**100**	**388**	**100**	**603(100)**

Source: Field Survey, 2018

The results further showed that 43.7% under-five mortality occurred among women that sleep more than 7 in a room, with the least under-five mortality (12.2%) experienced by women that sleep 3-4 in a room. The results further revealed that 37.1% under-five mortality occurred among women that do not use cooling appliance, with those using air conditioner

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experiencing the least under-five mortality of 9.3%. The highest under-five mortality (66%) occurred among women that do not use mosquito net, while those that use mosquito net experienced 34% under-five mortality. The results of the study also show that 33% of under-five deaths occurred among women that use wood as cooking fuel, while those that use electricity recorded the least under-five mortality of 3.3%. Women that keep sheep/goat experienced 29.3% under-five deaths, against those that domesticate cat with the least under-five mortality of 9.3% (Table 3)

Cultural Factors and Under-Five Mortality Experience

Table 4 reveals that Hausa ethnic group experienced 90.7% under-five mortality, while the Igbo women experienced the least under-five mortality (0.5%). The highest under-five mortality (92.6 %) was experienced by Muslim women, with respondents that practice traditional religion experiencing the least under-five mortality (0.5%). Under-five mortality (78.6%) occurred among women that practice food taboo, while the least under-five mortality (21.4%) occurred among women that do not practice food taboo. In the same vein, under-five mortality (72.6%) was experienced by women that belief in traditional medicine, while 27.4% under-five mortality occurred among women that do not belief in the traditional medicine.

Table 4: Distribution of Under-Five Mortality by Cultural Factors

	Ever lost under five				
	Yes		No		
Variables	**No**	**%**	**No**	**%**	**Total (%)**
Ethnicity					
Hausa	195	90.7	292	75.3	487(80.8)
Igbo	01	0.5	03	0.8	04(0.7)
Yoruba	04	1.9	36	9.3	40(6.6)
Kambari	02	0.8	12	3.1	14(2.4)
Fulfude	05	2.3	11	2.8	16(2.7)
Dakarikari	04	1.9	26	6.6	30(4.9)
Others	04	1.9	08	2.1	12(1.9)
Total	**215**	**100**	**388**	**100**	**603(100)**
Religion					
Christianity	15	6.9	63	16.2	78(13)
Islam	199	92.6	325	83.8	524(87)
Traditional religion	01	0.5	0	0	0(0.0)
Total	**215**	**100**	**388**	100	**603(100)**
Practice of food taboo					
Yes	169	78.6	140	36.1	309(51.2)
No	46	21.4	248	63.9	294(48.8)
Total	**215**	**100**	**388**	**100**	**603(100)**
Belief in traditional medicine					
Yes	156	72.6	139	35.8	295(48.9)
No	59	27.4	249	64.2	308(51.1)
Total	**215**	**100**	**388**	**100**	**603(100)**

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Belief about disease causation					
Malnutrition	37	17.2	75	19.3	112(18.6)
Witchcraft	60	27.9	118	30.4	178(29.5)
Germs	50	23.3	105	27.1	155(25.7)
I don't know	68	31.6	90	23.2	158(26.2)
Total	**215**	**100**	**388**	**100**	**603(100)**
Child sex preference					
Yes	136	53.9	218	62	354(58.7)
No	79	46.1	170	38	249(41.3)
Total	**215**	**100**	**388**	**100**	**603(100)**
Mother's autonomy on child's health					
Yes	78	36.3	246	63.4	324(53.7)
No	137	63.7	142	36.6	279(46.3)
Total	**215**	**100**	**388**	**100**	**603(100)**
Family decision on child's health					
Father	60	27.9	151	38.8	211(34.9)
Mother	47	21.9	98	25.3	145(24)
Both parents	34	15.8	107	27.6	141(23.4)
Grandfather	35	16.3	17	4.4	52(8.6)
Grandmother	39	18.1	15	3.9	54(8.9)
Total	**215**	**100**	**388**	**100**	**603(100)**

Source: Field Survey, 2018

Women that belief in witchcraft as causes of disease experienced 27.9% under-five mortality, while respondents that belief disease is caused by malnutrition recorded the least under-five mortality (17.2%). Table 4 further shows that the highest under-five mortality (53.9%) was experienced by women that have preference for child sex, while 46.1% was recorded by women that do not have preference for child sex. Under-five mortality (36.3%) was experienced by mothers that have autonomy on their child's health, while the highest under-five deaths (63.7%) occurred among mothers that do not have autonomy on their child's health. The results of the study further indicate that 27.9% under-five mortality was experienced by mothers that husband alone decides on child's health, while mothers that said both parents take decision on child's health experienced the least under-five deaths (15.8%).

Environmental Factors Affecting Under-five Mortality

Table 4 indicates that women that use river/stream as source of water (OR .201, P-value .002), uncovered well (OR .170, P- value .004) and other sources of water (OR .163, P-value .013) were 20%, 17% and 16% respectively more likely to experience under-five mortality when compared with those that use tap as source of water. In support of this finding, the use of water from poor sources such as river, stream, open well was found to be significantly associated with under-five mortality in Nigeria and Ethiopia (Akinyemi *et al,* 2013; Usman *et al*., 2016). Women that treat water (OR 0.45, P-value 021) were 45% less likely to experience under-five deaths, compared to mothers that do not treat water. In conformity with this finding, Oloruntoba *et al.* (2014) and Bitew *et al*., (2017) found mothers that do not treat water before use experiencing more under-five mortality in Ibadan and Ethiopia.

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Type of water storage container was found to be significantly associated with under-five mortality. The results predict 38% and 1.02 times risk of under-five mortality among women that store water in metal tank (OR .387, P-value .013) and clay pot (OR 1.02, P- value 041) respectively, relative to those that use drum/bucket/jerry can with cover. This present finding is not different from the ones carried out by Oloruntoba *et al.* 2014 and Tambe *et al.* 2015 suggesting the likelihood of diarrhea and under-five mortality among women using clay pot, rubber bucket and jerry can without cover in Ibadan and Cameroun. Table 4 further shows that women that wash water container monthly (OR 1.355, P- value .048) were 1.4 times likely to experience under-five deaths in relative to women that do that daily. Similar to this finding, infrequent washing of water storage container was also found to be associated with the risk of childhood deaths in Benin and Pakistan (Stocker and Moster, 2015; Khan and Na'az, 2018). Mothers pouring child's stool at the backyard (OR .677, P- value .034) were 68% at risk of experiencing under-five deaths in relative to mothers that flush child's stool with water. This finding is not different from that of Cronin *et al*, (2016) and Bawankule *et al*, (2017) that suggested high risk of under-five deaths among women that pour child's stool on open space in India and Indonesia. The result further indicates that women disposing waste water in an open field (OR .518, P-value .008), infiltration pit (OR .367, P- value .010) and simple pit (OR .312, p- value .021) were 52%, 37% and 31% respectively likely to experience under-five mortality, when compared with of women that use open drainage channels to dispose waste water. In agreement with this finding, a study carried out in Nigeria revealed that disposal of waste water in an open field was associated with diarrheal illness among under-fives (Oloruntoba *et al.,* 2014).

Table 4: Logistic Regression Analysis of the Environmental Factors Affecting Under-five Mortality

				95% C.I for EXP (B)	
Variables	**S.E.**	**P-Value**	**OR**	**Lower**	**Upper**
Source of water					
Tap	RC				
Covered well	.677	.476	.614	.164	2.349
Manual/Motorized borehole	.727	.013*	.163	.039	.679
Water vendor	.795	.386	.502	.106	2.384
River/stream	1.241	.002*	.201	.002	.222
Uncovered well	.608	.004*	.170	.052	.561
Others	.691	.368	.536	.138	2.07
Water treatment practice					
Yes	RC				
No	.121	.021*	.451	.471	12.33
Type of water storage container					
Rubber drum/bucket without cover	RC				
Clay pot	.616	.041	1.02	.373	2.449
Metal tank	.527	.013	.387	.530	.421
Rubber drum/bucket/ can with cover	.944	.101	.421	.517	.333
Rubber tank	.671	.327	.35	.311	.211
Others	.578	.644	.292	.294	.580

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Frequency of washing water container					
Daily	RC				
Twice a week	.596	.947	1.041	.323	.349
Weekly	.598	.584	1.387	.430	.476
Twice a month	.855	.678	1.426	.26	.263
Monthly	.574	.045*	1.355	.241	7.211
Method of waste water disposal					
Open drainage channel	RC				
Infiltration pit	.229	.010	.367	.437	.401
Open field	.554	.008*	.518	.290	.770
Simple pit	.651	.021*	.312	7.383	.702
Type of toilet					
Open pit without cover	RC				
Open pit with cover	.833	.057	4.879	.952	24.988
Water system with cover	1.138	.829	.782	.084	7.273
Water system without cover	774	.029*	5.418	1.190	24.68
Others	.802	.021*	6.464	1.321	30.671
Shared toilet					
No	RC				
Yes	.325	.006*	.555	.232	.893
Frequency of washing toilet					
Daily	RC				
Twice a week	.547	.121	.314	.173	2.114
Weekly	.224	.016*	.217	.161	2.419
Monthly	.165	.038*	.711	.328	2.233
Method of child's stool disposal					
Flush with water	RC				
Pour at the backyard	.677	.034*	.630	.163	2.314
Cover with sand	.677	.476	.614	.164	2.329
Pour in a pit latrine	.565	.558	.718	.238	2.173
Method of dumping refuse					
At the backyard	RC				
Stream/River	.546	.023*	.349	.325	2.766
Community refuse pit	.624	.044*	.402	.118	1.366
Others	.432	.999	.000	.000	.233
Type of living house					
Single room					
Room/Parlour	.680	.832	.866	.228	3.281
Bungalow	.833	.057	4.879	.952	24.988
Duplex	1.681	.546	2.758	.102	74.451
Story building	1.684	.752	2.194	.084	95.997
Type of roofing material					
Stone coated sheet	RC				
Thatched roofing	.963	.000*	9.567	4.628	20.873
Corrugated zinc sheet	.863	.585	.624	.115	3.386
Asbestos sheet	.795	.836	.848	.179	4.032
Others	1.545	.277	5.363	.260	10.755

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Types of floor					
Earth /mud					
Gravel	1.985	.698	.733	.248	2.144
Cement	.512	.792	.873	.320	2.384
Tiles	.691	.368	.536	.138	2.079
Others	.861	.283	.510	.312	2.484
No of windows per room					
1	RC				
2	.683	.828	1.160	.304	4.419
3	.847	.495	1.783	.339	9.380
None	1.608	.014*	1.469	.063	34.324
Number of persons per. Room					
1-2	RC				
3-4	.617	.078	3.604	1.075	12.083
5-6	.908	.032*	.298	.118	4.135
7 above	1.299	.029*	1.693	.104	16.87
Type of cooling appliance					
Ceiling fan	RC				
Table Fan	.801	.995	1.005	.209	4.830
Air conditioner	1.784	.527	3.094	.094	10.998
None	.861	.003*	2.510	2.312	67.684
Use of mosquito net					
Yes	RC				
No	.562	.041*	.624	.713	1.344
Type of cooking fuel					
Electricity	RC				
Gas	1.427	.866	.786	.048	12.898
Kerosene	1.402	.059	2.283	1.364	33.003
Charcoal	1.161	.007*	1.334	.445	42.172
Wood	1.136	.041*	1.471	.175	15.038
Animal Dug	2.042	.927	.829	.015	45.372
Others	1.250	.403	.352	.030	4.077
Type of animal domesticated					
Dog					
Cat	.786	.169	2.953	.632	13.792
Cattle	1.066	.306	2.975	.368	24.027
Sheep/Goat	.758	.561	1.554	.352	6.869
Birds	1.019	.168	.245	.033	1.806
None	1.945	.193	.079	.002	3.589

* **P- value** < 0.05 **RC** – Reference Category **OR** –Odd Ratio **SE**- Standard Error

Source: Field work, 2018

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Table 4 further shows that women that use water system toilet without cover (OR 5.418, p-value 0.29) and other toilet facilities (OR 6.464, P – value 0.21) were 5.4 and 6.5 times respectively at risk of experiencing under-five deaths, when compared with those that use covered open pit toilet. Previous studies such as Mundal *et al.* (2009), Susuman (2016), Makate and Makate, 2016) found the use of unsafe toilet facility to be associated with under-five mortality in Kenya, Bangladesh and Zimbabwe respectively. The result of the analysis also shows that under-five mothers that share toilet facility with neighborhood (OR 0.555, P-value .006) were 56% likely to experience under-five mortality, relative to mothers that do not share. Similar to this finding, a strong association was found between under-five mortality and shared toilet facility in Nigeria (Adeolu *et al*., 2016, Gbadebo *et al*., 2018). Mothers that wash toilet monthly (OR .711, P- value .038) and weekly (OR .217, P- value .016) were 71% and 23% respectively more likely to experience under-five mortality when compared with those that do that daily.

Table 4 also shows that there was no significant association between type of living house and under-five mortality. Mesike and Mojekwu (2012), Nurtor *et al.* (2017) did not also find any association between type of house used and under-five mortality in Nigeria and Ghana. However, Bitew (2017) found an association between dwelling houses and high odds of under-five mortality in Ethiopia. The type of floor was not significantly related to children's death. Contrary to the finding of this present study, Izugbara (2014) and Adeolu *et al*, (2016) found significant association between the type of floor and under-five mortality in Nigeria. Women that use thatch roof house (OR 9.567, P -value 0.00) were 9.5 times likely to experience child's death, relative to those that live in stone coated roof house. Previous studies have found that use of inadequate or unsafe roofing materials by households are more likely to experience under-five deaths in Nigeria and South Western Nigeria (Adebowale *et al.* 2017; Mesgan *et al*. 2017). Mothers that live in a house without window (OR 1.469, P – value 0.14) were 1.4 times likely to experience under-five mortality when compared with those that live in a house with one window. This present finding is similar to that of Abuka (2017) where it was found that under-five mortality was associated with living house without window.

Women that sleep 7 and more in a room (OR 1.693, P – value .029) and 5-6 in a room (OR .298, p- value .032) were 1.6 times and 30% respectively likely to experience under-five mortality when compared with women that sleep one or two in a room (Table 4). Similar to this finding, a studies in Australia and Sao Paulo suggested that children living in overcrowded room are more likely to experience respiratory problems such as coughing and asthmatic wheezing; and are also 10 times more likely to die of meningitis (Shelter, 2006; Sanders, 2007). Women that sleep under mosquito net (OR .624, P-value .041) were 62% more likely not to experience under-five mortality, relative to those that do not sleep under mosquito net. This finding is consistent with that of Adeolu *et al*. (2016) and Osuorah *et al,* (2013) that suggested higher odds of under-five mortality among women that do not use mosquito net in Nigeria.

In this study, result further indicates that women that do not have cooling appliance (OR 2.510, P – value. 0003) were 2.5 times at risk of experiencing under-five mortality, relative to mothers that use fan. Similar to this finding, Luber and MCGeehin (2008) reported that prolonged exposure to high indoor temperature can cause heat related deadly illnesses in both adult and children. Women using community refuse pit to dump refuse (OR .402, P – value 0.44) and stream/river (OR .349, p-value .023) were 40% and 35% at risk of experiencing

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under-five mortality when compared with mothers that dump refuse at the backyard. In Ibadan, Nigeria, it was similarly found that women using community pit to dump refuse exposed them to high risk of diseases and under-five mortality (Oloruntoba, 2014). Mothers that use wood as cooking fuel (OR 1.471, P – value 0.41) and charcoal (OR 1.334, p-value .007) were 47% and 1.3 times at risk of experiencing under-five mortality, when compared with mothers that use electricity which is non-polluting fuel in this study. Previous studies similarly suggested more children dying of respiratory infections among mothers that use wood, animal dung and straw for cooking in Ethiopia and Tanzania (Ayemahehu *et al*., 2014; Susuman *et al.,* 2016). The results of this study did not show any association between type of animal domesticated and under-five deaths. Similar result was reported by Oloruntoba (2014), suggesting that domestication of animals was not significantly related to under-five mortality in Nigeria.

Cultural Factors Affecting Under-five Mortality

In Table 5, mothers that belief in traditional medicine (OR .095, p – value .000) were 95% likely to experience under-five mortality, compared to those that do not belief in traditional medicine. Similar to this finding, women in Southwestern Nigeria and New Guinea's belief in traditional treatment of "Abiku" children (non-responsive to modern medicine) was found to be associated with child's health status (Fayisetan *et al,* 1997; Ogunjuyigbe 2004; Macfarlane, 2005). Mothers that do not have knowledge about what causes disease (OR 2.41, p- value 0.11) were 2.4 times at risk of experiencing under-five mortality, relative to women that belief malnutrition is the cause of disease. This result is supported by the work of Ashorn (2003) and Archibong *et al*. (2017) that found mothers associating the death of their children to witchcraft in Malawi and Calabar, Nigeria.

Table 5: Logistic Regression Analysis of the Cultural Factors Affecting Under-five Mortality

Ethnicity	S.E.	P-Value	OR	Lower	Upper
Dakarikari	RC				
Hausa	.555	.017*	.621	.014	.395
Igbo	1.465	.213	.231	.411	2.111
Yoruba	.531	.102	.220	.337	2.321
Kambari	1.012	.133	.121	.228	1.223
Fulfude	1.771	.211	.333	.677	4.361
Others	1.350	.303	.425	.5276	3.554
Practice of food taboo					
No	RC				
Yes	.238	.022*	.471	.077	.913
Total					
Belief in traditional medicine					
No	RC				
Yes	.275	.000*	.095	2.737	8.033

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Belief about disease causation					
Witchcraft	RC				
Malnutrition	.340	000*	.155	.080	.302
Germs	.329	.058	3.981	2.091	7.581
I don't know	.347	.011*	2.410	1.221	4.757
Child's sex preference					
Yes	RC				
No	.240	.140	.101	.063	.161
Mother's Autonomy on child's health					
Yes	RC				
	.231	.042*	.652	.833	6.317
No					
Family decision on child's health					
Both parents	RC				
Mother	.639	.349	.550	.157	1.922
Father	1.300	.033*	.063	.005	.800
Grandmother	1.250	.403	.352	.030	4.077
Grandfather	.307	.006*	2.399	1.276	4.251

* **P- value** < 0.05 **RC** – Reference Category **OR** –Odd Ratio **SE**- Standard Error

Source: Field work, 2018

The result in Table 5 further showed that home where grandfather take child's health decision (OR .307, P – value .006) is likely to experience 2.3 times under-five mortality, relative to home where both parents take child's health decision. This finding confirmed the work of Ashorn (2003) where it was reported that in majority of African societies, a man takes major decision on major matters, including child's health with both parents taken decision in rare cases; which has negative health implications on the child. Mothers from Hausa ethnic group (OR .621, P-value .017) were likely to experience 62 % under-five mortality, relative to Dakarkari ethnic group. In support of this finding, previous studies have shown significant differentials between ethnic groups in the odds of dying before the age of 5 years; suggesting under-five mortality to be higher among Hausa, Fulani and Kanuri ethnic groups in Nigeria (Antai, 2010; Antai, 2011; Arigbede, 2012; Adedini, 2013 and Mundi *et al.,* 2019).

Table 5 further indicates that mothers that practice Islamic religion (OR .414, P-value .021) were 41 % more likely to experience under-five mortality than mothers in Catholic faith. Consistent with this finding, Bhalotra *et al* (2013), Yaya *et al.* (2017) and Mundi *et al*. (2019) also found women belonging to Islamic faith to be associated with under-five mortality in Nigeria, India and Adamawa state, Nigeria.

The result also showed that mothers who practice food taboo (OR .471, P-value .022) were 47% likely to experience under-five mortality, relative to those that do not practice food taboo. In support of this finding, Sanghvi *et al.* (2001) found under-five at risk of dying due to their mothers' belief in food taboo in India. Mother's autonomy on child's health (OR .652, P-value .043) was associated with under-five mortality in the study area. The result shows that 65 % of the children are at risk of death among women with no autonomy on

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child's health matters, relative to those that have. In agreement with this finding, Fantahu *et al* (2007) and Khan *et al* (2018) predicted likely occurrence of under-five mortality in Ethiopia and Pakistan due to low decision-making power of women in respect of their children's health

CONCLUSION AND RECOMMENDATION

The main purpose of this study was to determine environmental and cultural factors affecting under-five mortality in Kebbi state. Despite the efforts of the government to reduce under-five mortality, it is still high in Kebbi state. The results of the Logistic regression analysis revealed that source of water, frequency of washing water container, water treatment, method of disposing waste water, type of toilet, shared toilet, frequency of washing toilet, method of disposing child's stool, type of cooling appliance, number of persons per room, use of mosquito net, refuse disposal method and type of cooking fuel were found to be environmental factors significantly affecting under-five mortality; while ethnicity, religion, practice of food taboo, belief in traditional medicine, belief about disease causation, mother's autonomy on child's health and family's decision on child's health were found to be cultural factors significantly affecting under-five mortality in Kebbi state. In conclusion, environmental and cultural factors affect under-five mortality in Kebbi state. Therefore, it was recommended that to reduce under-five mortality rate government at all levels should step up efforts in providing adequate infrastructure such as potable sources of water, sanitary facilities, water drainage system and safe refuse disposal system for public use. Government at all levels, and cultural organizations should scale up advocacy programmes aimed at improving women participation in child's health decision-making in the society. Also, women and their spouses should be educated on some cultural beliefs that have negative effects on child's health.

Ethical considerations

All respondents consented to participate in this study. Also, ethical clearance from the Ethics Research Committee of Kebbi State Ministry of Health was sought and granted.

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