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Pattern of Household Cooking Fuel Use and Knowledge of It Effect on Health among Health Workers in a Tertiary Hospital in South-South Nigeria

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Abstract: Household air pollution (HAP) arising from use of high polluting cooking fuel use remains a global health threat .This study sought to determine the major type of household cooking fuel used by workers ,their level of knowledge of the health effects of use of various categories of house hold cooking fuel, the association between level of knowledge and category of cooking fuel used and the determinants of category of cooking fuel used by respondents A questionnaire based descriptive cross-sectional study was carried out among 352 staff of the University of Uyo Teaching Hospital, Nigeria selected by multi-stage sampling technique between July and October,2017. Data was analyzed with STATA version 10. The major cooking fuel used was liquefied petroleum gas, LPG 221(62.8%). A good proportion 222 (63.1%) also used an alternative cooking fuel with kerosene 88 (37.8%) being the commonest. Main reason for choice of major cooking fuel was convenience 100 (28.4%). Most respondents had good knowledge (70.5%) of the effects of cooking fuel on health. Few knew that cooking fuel is associated with low birth weight 98 (27.8%) and cancer of the lungs174 (49.4%). Categories of staff and level of education were significantly associated with level of knowledge of effect of cooking fuel on health (P<0.001 and P=0.01 respectively) .Determinants of category of cooking fuel used by respondents were level of knowledge (P=0.004), education (P= 0.00), category of staff (P=0.002), place of residence (P=0.008), type of house (P=0.000) and main cooking site (P=0.000).LPG was the major cooking fuel used .Level of knowledge of the health effects of cooking fuel was good though areas of knowledge gap existed .Intensive public enlightenment programs is needed to sustain the awareness and address the knowledge gaps. Government policy of abolishing gas flaring will improve access to clean household cooking fuels and enhance its use.

Keywords: Household cooking fuel, Uyo, Nigeria, Health workers.

INTRODUCTION

Energy is critical to any country's economic growth and development. The importance of cooking fuels in the life of every household is not debatable because most food items must be cooked, smoked, dried or heated before consumption. Cooking in a household involves the use of solid and non-solid fuels. The solid fuels consist of coal, which is a fossil fuel, and biomass fuels like wood, charcoal, dung and crop residues. The non-solid fuel consists of kerosene, liquefied petroleum gas, LPG and electricity [1]. Fuels can also be divided into clean and unclean fuels. The clean fuels include LPG/cooking gas and electricity while the unclean fuels include firewood, coal, kerosene, and dung and crop residues [2]. Biomass fuel account for approximately 14% of final energy consumption [3]. The proportion of the population relying on biomass is highest in sub-Saharan Africa. In most countries in sub-Saharan Africa, more than 90% of the rural population rely on fuel wood and charcoal to meet their energy requirements while over half of all urban households rely on fuel wood, charcoal and wood waste to meet their cooking needs [4] However, access to modern, affordable and reliable energy services is an enormous challenge facing the African continent, particularly Nigeria [5]. The launching by the World Bank of the 'Africa Clean Cooking Energy Solutions' to promote dissemination and adoption of clean cooking solutions and the 'East Asia and Pacific region's Clean Stove Initiative' (CSI) to scale up access to advanced cooking stoves for rural poor households through country-specific technical assistance and a regional knowledge-sharing and cooperation forum [6] are some efforts to tackle this problem. These efforts have, however, not yielded the desired result as most households in Africa still depend on inefficient energy sources [7].

The national electricity access and per capita consumption of electricity in Nigeria was reported in the third volume of West Africa monitor quarterly of Africa Development Bank Group in 2014 to be 48% and 149KWh, lower than values reported for Senegal

(56% and 187KWh/person), Ghana (72% and 344KWh/person) , countries with less amounts of energy resources than Nigeria. The electricity supply in Nigeria is characterized by frequent power outages thus making it unreliable. This acute shortage and irregular supply of clean energy sources has also caused more households in Nigeria to depend on traditional energy sources such as wood, animal dung and agricultural residue causing personal health and environmental problems such as excessive deforestation [8].

In Nigeria, the use of biomass as fuel has been increasing, while the use of higher fuels decreases at a highly unacceptable rate. It is reported that between 1980 and 2004, the use of firewood increased from 47.6 to 70.8 %, while the use of kerosene and electricity declined from 49 to 26.6 % and from 2.6 to 0.5 %, respectively. The use of LPG has also remained low (1.1 %) through the period.[9].The problem seems to be worsening as about 86 % of households still depend on fuel wood as their source of energy [10]. The 2013 NDHS further confirmed that the major cooking fuel use in urban areas in Nigeria is kerosene (47.6%), wood (37.9%) and LPG occupying a distant 4th position with 4.6% of population using it. Wood however, was the reported major cooking fuel in rural areas (83.3%)[11]. A related study in Nigeria reported wood only (32.2%), kerosene only (20.8%) , charcoal only (17.1%) and LPG only (7.25%) as majr cooking fuels used. [12].The use of high polluting fuel has led to exposure to health damaging pollutants and their consequent implications from indoor air pollution.

Household air pollution (HAP) arising from solid fuel use remains a global health threat .In the 'global burden of disease study' HAP was ranked the second major contributor to the burden of diseases, after unsafe water and sanitation [13] Mainly women in these countries are engaged in cooking activities. Their newborns and kids spend a substantial amount of time with the mothers in the kitchen and so are exposed to harmful substances from polluted cooking fuel including carbon mono-oxide, oxide of nitrogen and sulfur, benzene formaldehyde, 1,3-butadiene, and polyaromatic compound [14]. Furthermore, small apartment/house oriented life structure and indoor based life of children under-five may contribute to higher levels of exposure to air pollution, leading to the development of acute respiratory infections, ARI. Globally ARI is a leading cause of death in children and its association with HAP has been well established [15, 16]. It is reported that about 3.5% of the worldwide burden of disease for under-five children and 15% of total under-five mortality are associated with ARI [17]. Previous studies reported that solid fuel use is a major risk factor for ARI [18, 14, 19].Exposure to HAP doubles the risk of pneumonia and acute lower respiratory infection, contributing to over 800,000 deaths in children under five years of age[20, 21, 22]

Epidemiological studies found association of HAP with a range of adverse health and birth outcomes among women [23,24]. For instance, around 34% of stroke, 26% of ischemic heart disease, 22% of chronic obstructive pulmonary disease, and 6% of lung cancer and tuberculosis were attributed to indoor air pollution [25-27]. Indoor cooking place and indoor use of solid fuel increased the risk of low birth weight, LBW [28, 29, 30] An incomplete combustion, which is likely to occur in indoor cooking using solid fuel, may result in much of the fuel energy being emitted as potentially toxic pollutants including higher levels of carbon-monoxide. The fetus is particularly vulnerable to the transmission of such pollutants that a pregnant woman inhales from the living spaces which reduce the oxygen carrying capacity of blood to the body tissue [29] thus a developing fetus can be deprived of adequate oxygen, leading to intrauterine growth retardation and risk of LBW [31]. Furthermore, studies in the United States [23, 24]and Sweden [32] found higher risk of gestational diabetes, gestational hypertension, lower gestation age and preeclampsia among solid fuel users.

Reducing indoor air pollution and its adverse effects on preventable maternal and under-five mortality are the key targets in Sustainable Development Goal-3 [33].

The growing global evidence of the association between house hold cooking fuel and health and the absence of such a study in the setting formed the basis for this study The findings of this study will provide the understanding of this evidence in this setting. Findings will also form the basis for the enlightenment of the public on the health risks associated with indoor air pollution from use of unclean fuels in household cooking. This will invariably lead to reduction in morbidity and mortality associated with diseases caused by indoor air pollution in the state and Nigeria at large. It will also provide information that can be used for local and national planning and policy making. The study therefore sought to

- Determine the main type of household cooking fuel used by workers in the University of Uyo Teaching Hospital, Uyo.
- Determine the level of knowledge of the effects of household cooking fuel on health by workers in the University of Uyo Teaching Hospital, Uyo.
- Determine the association between the level of knowledge of the health effects of various household cooking fuels and the type of cooking fuel used by workers in the University of Uyo Teaching Hospital, Uyo.
- Determine the association between the socio-demographic and other characteristics of workers in the University of Uyo Teaching Hospital, Uyo and the type of cooking fuel they use.

MATERIALS AND METHODS

Study Location

The study was carried out at the University of Uyo Teaching Hospital, a federally owned tertiary hospital located in Uyo, the state capital of Akwa Ibom State in south south Nigeria. The state lies between latitudes 4°32'N and 5°33'N, and longitudes 7°25'E and 8°25'E with a population of over 5 million people. It is one of the major oil producing states in Nigeria where gas flaring is also done by the oil producing companies.

Study Design and Ethical Approval

This was a cross sectional study conducted among health workers in University of Uyo Teaching Hospital, Akwa Ibom State from July to October, 2017. .Ethical approval was obtained from the Ethical Review committee of the University of Uyo Teaching Hospital .Informed consent was obtained from respondents before administration of questionnaires.

Sample size determination

Three hundred and ninety five (352) adults were selected for the study using the formula for obtaining sample size as follows:

$n=z^2pq/\partial^2$

Where;

n = minimum sample size

Z = Given Z value (1.96)

P = Percentage of Nigerians who use Solid fuel in cooking, 0.32% [12]

∂ = acceptable margin of error (5%)

A sample size of 334 was obtained. To make room for poorly filled questionnaires, a 5% non-response rate was added to obtain a sample size of 352.

Sampling Technique

352 workers were randomly selected using a multistage sampling method. The first stage involved categorizing workers into clinical and non- clinical groups and then into various departments. The list of staff in various departments was obtained from the Human resource unit of the hospital. As at March 2017. The clinical staff included the doctors, nurses, laboratory scientists, physiotherapist and others and the non clinical staff include the management and support staff.

Stage 2 involved the selection of staff from each department to make up the calculated minimal sample size. The number each department contributed to the total was based on the size /population of staff in each department. The total number and percentage of staff in each department was calculated and the sample size determined in proportion to the size of each department. The proportion was determined thus =minimum sample size/ total number of staff in the hospital. Hence total number of staff in each department was multiplied by this fraction to determine the number of participants each department contributed. Very ill staff and those on various forms of leave who were not available at the time of study were excluded.

Stage 3: This involved selection of respondents for the study. Participants were consecutively recruited until the number from each department was obtained .Doctors were recruited in the doctors common lounge and consulting rooms, nurses from the wards, laboratory staff were selected at the laboratory and pharmacists at Pharmacy sites. Adminstrative officers were recruited in their offices

Instrument

The questionnaire was developed after a thorough literature review and further pre-testing and evaluation by experts in public health to ensure quality and content validity. It was was self-administered and developed according to the specific objectives of the study. The questionnaire consisted of 3 sections (A-C). Section an obtained respondent's socio-demographic data. Section B obtained type of cooking fuel used and house hold characteristics of respondents and section C dwelt on the level of knowledge of the health effects of cooking fuel. Nine questions were asked to test the knowledge of the health effects of various cooking fuel on health. These questions were scored and the respondents grouped to have poor or good level of knowledge based on the score. The Wrong answers were scored as 0 and one mark for correct response. Maximum score was 9 and scores less than or equal to 4 was considered as poor level of knowledge while scores of 5 and above was considered good level of knowledge.

Analysis

The data obtained was collected, collated, cleansed and analyzed using STATA 10 windows version. Categorical data was summarized using frequency and percentages while quantitative data was summarized using mean and standard deviation or median and interquartile range. The association between socio-demographic characteristics and type of cooking fuel used and knowledge of health effects of use of various cooking fuel was determined using Chi Square test at a significant level of $P < 0.05$.

RESULTS

The mean age of respondents was 36.03 $\pm$ 8.21 years with a range from 19-60 years. More than half 193 (54.8%) were females. The majority, 302 (85.8%) were indigenes, married 231 (65.6%) and completed tertiary education 300 (85.2%) respectively. Three quarters 266 (75.5%) were clinical staff. The median monthly family income was N100, 000.00 and monthly income ranged from N10, 000.00 to N4, 800, 000.00. The mean income spent on cooking fuel was N4, 488.75$\pm$ N 2,667.27. Most households had more than 5

members 207 (58.8%) with the median number of house hold number of 5 Less than half, 171 (48.6%) had children under 5 years of age. Many 284 (80.7%) described their residence to be in urban areas. Females mainly do the cooking 305 (86.6%) and an average of 2.4 hours was spent on cooking. The majority lived in flats 296 (84.1%) (See table 1).

Table-1: Socio-demographic, Household and Building characteristics of respondents (N= 352)

Socio-demographic characteristics	Frequent	Percentage
Age (years)		
Mean 36.03± 8.21		
Gender		
Males	159	45.2
Females	193	54.8
Tribe		
Indigenes	302	85.8
Non Indigenes	50	14.2
Marital status		
Single	112	31.8
Married	231	65.6
Widowed	9	2.6
Level of Education		
Completed Primary education	8	2.3
Complete d secondary education	44	12.5
Completed tertiary education	300	85.2
Staff Category		
Clinical staff	266	75.6
Non clinical staff	86	24.4
Monthly Income (in Naira)		
MedianN100,000.00 (Range N10,000-N4,800,000.00)		
Monthly Income spent on cooking fuel (in Naira)		
Mean N4,481.75 ± N2,667.27		
Number of people in Households		
1-4	145	41.2
5 and above	207	58.8
Median 5 (IQR 3)		
Number of Households with U-5S		
Have under -5 s	171	48.6
No under -5s	181	51.4
Residence Location		
Rural	68	19.3
Urban	284	80.7
Who cooks		
Males	47	13.4
Females	305	86.6
House Type		
Single rooms	56	15.9
Flats	296	84.1

The major cooking fuel used was LPG (gas), 221 (62.8%). A good proportion of respondents used low polluting fuel 222 (63.1%). Use of alternative cooking fuel was high 222 (63.1%).Kerosene 88 (39.6%) was the commonest alternative cooking fuel used .The majority (81.0%) of respondents cooked indoors. Three major reasons for choice of main cooking fuel was convenience 100 (28.4%), cooks faster 77 (21.9%) and cheap 59 (16.8%). Preserving health as a reason for choice of major cooking fuel was the least reason 5 (1.4%) (See table 2).

Table-2: Characteristics of Cooking Fuel of Respondents

Characteristics	Frequency	Percentage
Major type of cooking fuel used		
Gas	221	62.8
Kerosene	92	26.1
Firewood	38	10.8
Electricity	1	0.3
Classification of cooking fuel		
Low Pollution fuel	222	63.1
High Pollution Fuel	129	36.6
Use of alternative cooking fuel		
Yes	222	63.1
No	130	36.9
Alternative Cooking Fuel Used		
Kerosene	88	39.6
Firewood	58	26.1
Electricity	47	21.2
Gas	24	10.8
Charcoal	5	2.3
Main cooking site		
Indoors	285	81.0
Outdoors	67	19.0
Main Reason for using major cooking fuel		
Convenience	100	28.4
Cooks faster	77	21.9
Cheap	59	16.8
Safe and less risky	55	15.6
Readily available	46	13.1
Gives better taste	10	2.8
Is more healthy to use	5	1.4

Most respondents knew that cooking fuels can cause injuries (89.8%), Indoor air pollution, IAP (81.3%) and death (79.8%). A small proportion knew that type of cooking fuel can lead to cancer (49.4%), cataract (35.2%) and affect birth weight of babies (27.8%) respectively.(see table 3)

Table-3: Respondents Knowledge of the Effects of Cooking Fuel on Health (only positive responses reported)

Knowledge Questions	Frequency	Percentage
Type of cooking fuel used can cause injuries	316	89.8
Type of cooking fuel used can cause indoor air pollution	286	81.3
Type of cooking fuel used can cause death	281	79.8
Type of cooking fuel used can cause ill health	268	76.1
Type of cooking fuel used can cause respiratory tract infection	233	66.2
Children under the age of 5 years are more affected by type of cooking fuel used	217	61.6
Lung cancer could be caused by type of cooking fuel used	174	49.4
Type of cooking fuel used can cause cataract	124	35.2
Type of cooking fuel used can affect the birth weight of babies	98	27.8

There was a statistically significant association between categories of staff , level of education and level of knowledge of effect of cooking fuel on health ($P<0.001$ and $P=0.01$ respectively) .The clinical staff had better knowledge and there was a positive association between level of education good level of knowledge (see table 4)

Table-4: Association between selected characteristics and level of knowledge of effect of cooking fuel on health

Characteristics	Level of knowledge		Total	Statistical test and values
	Poor	Good		
Categories of staff				X^2 = 13.654
Clinical	65 (24.4)	201 (75.6)	266	P <0.001
Non clinical	39 (45.3)	47 (54.7)	86	DF=1
Level of education				X^2 = 9.299
Completed primary	5 (62.5)	3 (37.5)	8	P=0.01
Completed sec.	19 (43.2)	25 (56.8)	44	DF=2
Completed tertiary	80 (26.7)	220 (73.3)	300	

Level of knowledge (P=0.004), level of education (P= 0.00), category of staff (P=0.002), place of residence (P=0.008), type of house (P=0.000) and main cooking site (P=0.000) were significantly associated with category of cooking fuel used by respondents.(see table 5)

Table-5: Association Between selected factors and category of cooking fuel used by respondents

Variables	Category of cooking Fuels		Total	Statistical tests and values
	Low polluting fuel n (%)	**High Polluting Fuel** n (%)		
Level of Knowledge				X^2 = 9.289
Poor	53 (51.0)	51 (49.0)	104	P=0.004*
Good	169 (68.1)	79 (31.9)	248	DF=1
Gender			159	X^2 = 2.225
Males	107 (67.3)	52 (32.7)	193	P=0.150
Females	115 (59.6)	78 (40.4)		DF= 1
Ethnic Group				X^2 =1.996
Akwa Ibom Indigenes	186 (61.6)	116 (38.4)	302	P=0.205
Non Indigenes	36 (72.0)	14 (28.0)	50	DF=1
Marital status				X^2 =1.792
Single	65 (58.0)	47 (42.0)	112	P=0.408
Married	151 (65.4)	80 (34.6)	231	DF=2
Widowed	6 (66.7)	3 (33.3)	9	
Level of Education				X^2 =44.055
Completed Primary	0 (0.0)	8 (100.0)	8	P<0.001*
Completed Secondary	12 (27.3)	32 (72.7)	44	DF=2
Completed Tertiary	210 (70.0)	90 (30.0)	300	
Categories of staff				X^2 =9.895
Clinical staff	180 (67.7)	86 (32.3)	266	P=0.002*
Non clinical staff	42 (48.8)	44 (51.2)	86	DF=1
Place of residence				X^2 =7.649
Rural	33 (48.5)	35 (51.5)	68	P=0.008*
Urban	189 (66.5)	95 (33.5)	284	DF=1
Type of House				X^2= 24.277
Single rooms	19 (33.9)	37 (66.1)	56	P <0.001*
Flats	203 (68.6)	93 (31.4)	296	DF=1
Main cooking site				X^2= 87.527
Indoors	213 (74.7)	72 (25.3)	285	P=0.000*
Outdoors	9 (13.4)	58 (86.6)	67	DF=1
No. of people in Household				X^2 = 1.043
1-4	96 (66.2)	49 (33.8)	145	P=0.315
5 and above	126 (60.9)	81 (39.1)	207	DF=1
Household with under-5s				X^2 = 0.001
Have under-5s	108 (63.2)	63 (36.8)	171	P=0.999
Don't have under-5s	114 (63.0)	67 (37.0)	181	DF=1

DISCUSSION

The study revealed that the major type of cooking fuel used by respondents was Liquefied Petroleum gas/gas (LPG). This finding is in agreement with the report of a similar study done in Isiohor community in Edo state, southern Nigeria [34]. A contrary finding was reported in the Nigeria Demographic and Health survey, NDHS [11] where the major cooking fuels use in urban areas were kerosene (47.6%), wood (37.9%) with LPG/gas occupying a distant 4th position with 4.6% of population using it. Firewood was the major cooking fuel in rural areas (83.3%) [11]. A related study in Bauchi metropolis, a non- oil producing State in Northern Nigeria corroborated the findings of NDHS reporting wood only (32.2%), kerosene only (20.8%), charcoal only (17.1%), and LPG only (7.25%) as the major cooking fuels [12]. Compared to the latter results, this study showed an improvement in the proportion of respondents using low polluting fuel (LPG) as primary cooking fuel. This will definitely reduce the negative health effect from use of kerosene and biomass fuel on the people and slow the rate of deforestation associated with use of wood for cooking [12]. Results of this study also support the findings by Manyo-Plange [35] that household heads would rather use gas for cooking because of excessive smoke from firewood and its attendant health risk compared to LPG. Increase availability of relevant infrastructure in the Niger-Delta region such as petrol and gas stations closely located on the major streets of the study area ensures the availability of LPG and kerosene for use by the health workers. The comparison in the price of kerosene and LPG in the country and the fact that use of kerosene darkens the color of cooking pots leading to more time and efforts spent in its washing increases the patronage for LPG over kerosene in the area. The study area is located in the rain forest zone of the country with rain falling in almost every month of the year. This lead to seasonal availability of wood with the lowest availability in the rainy season. This may also explain the higher preference of respondents for LPG which is not seasonal.

All respondents were all in formal employment. Being in formal employment was linked with increased likelihood to cook with liquefied petroleum gas [36] because household heads in the formal sector earn more income and are likely to use cleaner cooking energy. However, Pundo and Fraser [37] reported a contrary finding of a negative relationship between employment and cleaner fuel. In addition, the irregular electricity supply, a known low polluting fuel in the area/country may account for the very low use of electricity as the primary cooking fuel in this study.

The results further show that many of the respondents use multiple fuels as secondary cooking fuel. Kerosene, firewood and electricity were the 3 common secondary cooking fuel used. This agrees with a related study where multiple cooking fuel use was reported [12].Lack of constant availability of some cooking fuels (for example kerosene and LPG) due to recurring strike action by unions responsible for provision of the commodities and seasonal changes that affects the availability of firewood may be responsible for the use of multiple fuels in this study. The use of multiple fuels is thus a strategy by households to acquire energy security when one form of energy may not be readily available for various reasons. Furthermore, this behavior obeys the fuel stacking model of household cooking pattern that assumes that household energy use patterns depend on several factors which could be social, economic, cultural, or even personal preferences. Therefore, rather than transiting linearly to cleaner fuels, households tend to increase the number of fuels used as their income increases without actually abandoning the old ones [38]. Other reasons for use of multiple cooking fuels include preferences for a particular fuel type used to cook a particular type of food, for a particular time or occasion, for convenience, or due to uncertainty about the supply of a fuel type' [39].

Most of the respondents had a good knowledge of the ill-effects of use of high polluting fuels .This is in agreement with the findings in a related study [12].However, poor level of knowledge was reported in another study[34]. The high level of knowledge could be due to the study being conducted among health workers who are well enlightened on health related issues. Also most of them earned good salary and therefore could afford the mass media where information on various subject matter is available. The good educational qualifications of these respondents may also account for this good level of knowledge. Nevertheless, there were still knowledge gaps in areas concerning cooking fuel and low birth weight, cataract, and lung cancer.

This study found that there was a significant association between a good level of knowledge of health effects of use of cooking fuels and use of low polluting fuels. In this study, level of education of respondents was significantly associated with use of low polluting fuel. Most respondents in this study (85.2%) completed tertiary education, a requirement for employment of many employees in a tertiary hospital. A similar study among Household heads equally revealed that those who attained higher levels of education had a higher probability of using liquefied petroleum gas for cooking compared to those with lower education [12, 36]. Education is reported to improve knowledge of fuel attribute, taste and preference for better fuels [37]. In

addition, an educated person may lack time to collect firewood due to tight schedule and will therefore, prefer firewood alternatives [37] Educated household heads are more likely to use cleaner fuel for cooking [40-42].

The clinical staff was more knowledgeable on the health effects of cooking fuel on health than non-clinical staff. This may mainly be due to their training as health workers which focus on health issues. Since knowledge influences use of clean cooking fuels, they were more likely to use same compared to non- clinical staff.

Most respondents in this study resided in urban areas (80.7%) where wood which is usually brought into the metropolis from villages is lacking. Use of wood is also seasonal thereby forcing households to go for alternative fuels that are mostly available and are more efficient. Lack of space in urban areas and with the majority of them living in flats gave little them no space to store bulky cooking fuels like firewood hence their preference to LPG. This finding agrees with a similar study [12] which revealed that respondents living in buildings with internal kitchens and little or no space for keeping bulky fuels prompted the use of LPG/gas.

In this study, most respondents cooked indoors mainly because they lived in flats. This discouraged the use of high polluting fuels like firewood. The differential levels of pollutants in indoor versus outdoor cooking is illustrated in a study in rural Bolivia where a 6-hour mean levels of indoor PM_{10} while cooking using dung was 1,830 $\mu g/m^3$ in indoor kitchens and 250 $\mu g/m^3$ in outdoor kitchens [43]. This exposure to pollution from wood burning stoves for indoor heating is associated with severe respiratory symptoms and infections [44].

As the size of household increases, the quantity of food to be cooked also increases and the energy demand in household tends to increase. This increases forces households to fall back to cheaper, lower fuels such as wood [12]. However, this study found no significant association between household size, number of fewer than five children and choice of cooking fuel. Unlike a related study where the average family size was large[12], there was a relatively small family size in this study and the easy availability of LPG and its comparative price with other cooking fuel may explain why families stuck to the use of LPG.

CONCLUSION

The study revealed that the low polluting fuels (LPG/gas) was major cooking fuel used. Majority of the respondents also used alternative cooking fuel especially kerosene. There was a good level of knowledge about the health effects of household cooking fuel but there were still knowledge gaps on effect of cooking fuel on cataract, cancer and LBW. The study found a significant association between use of low polluting fuel and level of knowledge of health effects of cooking fuel, level of education of respondents, category of staff, residence of respondents, type of houses respondents lived and the major site used for cooking .Intensive health education should be carried out in various department of the hospital to draw the attention of staff to the health effects of use of various cooking fuels. Staff currently using high polluting fuels (kerosene, firewood, charcoal) should be encouraged to switch to LPG, a proven low polluting fuel. Abolishing the flaring of natural gases by oil producing companies in the state and country will make the LPG more available and affordable for the people to use. In addition, improving the electric power supply in the State will make people have more access to another clean cooking fuel.

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