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Perceived Effects of Charcoal Production and Usage on Human Health in Ogbomoso Zone of Oyo State

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Abstract – The production and usage of charcoal by rural dwellers as source of energy has contributed significantly to the development of the rural people but nevertheless, it has come with a huge price on the health status of individuals involved in its production and usage. This study therefore determined the perceived effects of charcoal production and usage on the health status of the rural dwellers in Oyo State. Multistage sampling technique was used to select Ninety (90) respondents (both producers and users). Data for this study was collected through structured interview schedule and analyzed with frequency counts, percentage, mean and ranking as main descriptive statistical tools while Pearson product moment correlation (PPMC) was employed to make inference between the variables. The mean age of the respondents was 33.8 years, both male (68.9%) and female (31.1%) constituted the sampled population, almost all the respondents were literate with varied level of educational status with a mean of 6.7 years of experience in production and usage of charcoal as a source of energy. All (100%) the respondents used earth mound method for charcoal production while none of the respondents indicated metal kiln as a method used for charcoal production. Body pains, injuries and wounds to charcoal producers and rural dwellers, laceration of hands due to production and body odour to users and charcoal producers were the major effects on health status of the respondents. Selected socio-economic variables (age- -0.285, p<0.01; household size- 0.314**, p<0.01; years of experience- -0.375**, p<0.01; income- -0.413**, p<0.01; quantity of charcoal produced- -0.450**, p<0.01) exhibited significant relationship with respondents perception on effects of charcoal production and usage on health of rural dwellers. Subject matter specialist should enlighten rural dwellers and charcoal producers association on ways to curtail health hazard incurable from charcoal production and usage.**

Keywords – Perceived, Effects, Charcoal, Production, Human health.

I. INTRODUCTION

Globally, the use of energy in form of biomass and biofuel such as fire wood, charcoal, petroleum, kerosene and gas are becoming competitive depending on the level of development of each nation[(1)]. Charcoal is an age-long source of energy, but it is as well still a major source of energy for producing heat for ironing, cooking and warming house in both rural and urban centres. It is in addition, a source of foreign income for the country as it been used across the world with Nigeria being part of major producer for human use.

In Nigeria as a whole, charcoal is not only the major source of household energy for the majority of the rural and urban dwellers, it is also a significant contributor to national energy balances, an important source of household incomes, and a potentially renewable energy source capable of powering significant economic growth while reducing dependency of poor developing countries on costly energy imports [(2,3)]. Charcoal is typically a fuel used in urban areas as it is seen as having fewer of the negative side effects of cooking with wood (i.e. dangerous, smoky) while being more cost-efficient than petroleum products. The increasing urbanization

rate at an average increase of 1.49 percent per year [4] may help to explain why charcoal production is increasing at a far faster rate than wood fuel production, though the increase in rate of use is tantamount to increase in production rate which is having a significant effect on the pollution of the environment thus leading to adverse effect on the health status of the producer.

Health is an important aspect of human life. It encompasses all activities aimed at ensuring the protection of the body from diseases and promoting good habit[5]. The impact of charcoal production on human health and the environment have been reported in literatures [6, 7, 8]. The authors emphasized the impact of charcoal production to include impact on soil minerals, disorder, depletion of the ozone layer and the severe hazard on the health status of the producer.

Several factors constitute to the health effects of charcoal production; charcoal is produced both traditionally and use of modern techniques, methods of producing charcoal require great effort by the producers, especially in the traditional way [1]. High dependence on the production and use of charcoal has resulted in various health hazards during production [9].

Many people suffer from one ailment or the other ranging from acute to chronic diseases such as head ache, respiratory diseases, cough, sputum production, dyspnea, and hemoptysis as a result of their involvement in charcoal production [10]. Charcoal production therefore creates serious concern for health and environmental sustainability in the near future. This study therefore focused on perceived effects of charcoal production and usage on health of rural dwellers in Ogbomoso zone of Oyo State, Nigeria. Specifically, the study described the socioeconomic characteristics of the respondents in the area; identified methods used for charcoal production and examined the effects of charcoal production and usage on charcoal producers and users in the study area.

II. Methodology

The study was carried out in Ogbomosho Agricultural zone of Oyo State, Nigeria. The zone is one of four Agricultural zones in Oyo State. Multistage sampling procedure was adopted in this study. During the first stage, three Local Government Areas (LGAs) were purposively selected from the five LGAs that constitute the zone, because of their dominance in charcoal production. The second stage involved the random selection of thirty (30) respondents in the study area, the selected population constituted both charcoal producers and the charcoal users in the study area and this sum up to a total of ninety (90) respondents used for this study. The descriptive statistical tools used in the study include frequency distribution, percentage, mean and ranking; while Pearson Product Moment Correlation was used as inferential tool to test the relationship that exists between the variables.

III. Results And Discussion

Socio-economic Characteristics of respondents

The result in Table 1 reveals the socioeconomic characteristics of the respondents used for this research work. The result revealed that majority almost 70.0% of the respondents were male while 31.1% were female. This result is an indication that both male and female were involved in the production and usage of charcoal production in the study area. The dominance of male in this study is connected to the involvement of charcoal producers in the study, as males are more involved in charcoal production compare to the female. Though female are also involved in the charcoal production cycle with them majorly executing the menial activities involved in charcoal production and likewise having males rarely getting involved in the usage of charcoal as the women are involved in the domestic use of charcoal. Also, 44.4% of the respondents were not more than 30 years of age, 29.0%, 14.4% and 12.2% indicated they were between 31-40 years, above 50 years and between 41-50 years of age respectively. The mean age of the respondents was revealed to be 33.8 years. This result implies that charcoal producers and users in the study area were still young and productive, matured and agile. This result is in consonance with the findings of [1], which reported that their respondents were still in their productive age. Charcoal production is labour intensive and this is a major reason why young people dominate charcoal production activities. Their agility is expected to influence the rate of charcoal production while their youth status is a contributor to the usage of charcoal as their level of exposure to the urban world discourages them to use firewood as source of energy. Charcoal usage for domestic activities such as cooking and supply of energy is seen to be less stressful and brings about class among their peers in the rural settings, hence the usage by the youths.

In addition, above average (51.1%) of the respondents indicated they have between 6-10 members as their constituents while 33.3% and 15.6% indicated not more than 5 members and above 10 members as their household size respectively. The mean household size of the respondents was revealed to be 7 members. Above average (53.3%) of the respondents indicated that they spent between 7-12 years in formal school, 40.0% and 4.45 indicated they spent not more than 6 years and above 12 years in school respectively while only 2.2% indicated they have no formal education.

Majority (61.1%) of the respondents indicated that they have not more than 10 years of experience in the usage and production of charcoal while 22.2% and 16.7% indicated that they have garnered between11-20 and above 20 years of usage and production of charcoal respectively. This result is an affirmation that youths are more involved in the production and usage of charcoal. This result is in line with the findings of Eniola *et al.,* [(11)], where majority of the charcoal producers and users have not more than 20 years of experience in the production and usage of charcoal.

In addition, 48.9% of the respondents indicated that they earn not more than ₦100,000 while 16.7% and 8.9% indicated amount that ranges between ₦101,000-₦200,000 and above ₦200,000 respectively. The mean amount of income realized from charcoal production by the respondents was revealed to be ₦149666.70. This result implies that the respondents realize substantial amount of money that bring relief to their financial responsibilities in their respective homes. This result is against the findings of Eniola *et al.,* [(11)], where the charcoal producers earn a mean income of almost ₦200,000 in the study area. Meanwhile, the mean income realized by the respondents is in consonance with the findings of Kofoworola [(12)], where his entire respondent realizes not more than ₦150,000 from charcoal production. Lastly, 42.2% of the respondents indicated they produced above 50 bags of charcoal while 16.7% indicated they produced not more than 50 bags of charcoal per production cycle respectively. The mean bag of charcoal produced in the study area per month was revealed to be 162 bags. This result is an indication that charcoal production is sustainable and reliable in the study area; hence it is expected to have influence on the rate of usage due to its availability. Availability of charcoal is tantamount to its usage.

Table 1 Socioeconomic characteristics of the respondents

Socio economic characteristics	Frequency	Percentages	Mean
Sex			
Male	62	68.9	
Female	28	31.1	
Age			
≤ 30	40	44.4	33.8
31-40	26	29.0	
41-50	11	12.2	
Above 50	13	14.4	
Household size			
≤ 5	30	33.3	7
6-10	46	51.1	
Above 10	14	15.6	
Years spent in school			
No formal education	2	2.2	
≤ 6	36	40.0	
7-12	48	53.3	
Above 12	4	4.4	
Years of experience in charcoal usage/production			
≤ 10	55	61.1	6.7
11-20	20	22.2	

Above 20	15	16.7	
Income from charcoal production (₦)			
≤ 100,000	44	48.9	149666.7
101,000-200,000	15	16.7	
Above 200,000	8	8.9	
Quantity of charcoal produced per month			
≤ 50	15	16.7	161.9
Above 50	38	42.2	

Source: Field survey, 2021

Method Used for Charcoal Production

Findings made from the research reveals that all (100.0%) of the respondents indicated earth mound as a known method used for charcoal production while above average (58.9%) and 48.9% indicated pit mound and mud method as known method for production of charcoal in the study area. This study is an indication that charcoal producers in the study area were aware of various methods used for charcoal production, meanwhile earth mound was the most used method and this might be as a result of lesser cost involved with the use of earth mound. This finding is in line with the result of Eniola and Odebode [1] where almost all (95.0%) of the respondents indicated earth mound as method used for charcoal production. The benefits accrued to the earth mound method such as expediency and high yield of charcoal production turnover may be the factor behind the continuous and dominant use of the method. According to the World Bank (2008), charcoal is mainly produced with earth mound technology in most countries of Africa. This result is also in consonance with the findings of Eniola *et al.*,[11], where the respondents indicated several methods such as earth mound, mud method and pit method as methods used for charcoal production though with earth mound the domineering method used for charcoal production by the respondents. The result is also in line with the findings of Lurimuah [13] done in Ghana where almost all (99.0%) indicated earth mound as the method used for charcoal production. With this, it is affirmed that earth mound is the most widely accepted and utilized method for charcoal production in the study area, Nigeria and Africa as a continent.

Table 2 Distribution of the respondents according to method of charcoal production

Method used for charcoal production	*Frequency	Percentage
Pit mound	53	58.9
Earth mound	90	100.0
Mud method	44	48.9

Source: Field survey, 2021

***:** Multiple responses

Effects of Charcoal Production on Health of Charcoal Producers and Rural Dwellers

The result in the table below revealed the effects of charcoal production on the health of charcoal producers and the rural dwellers that utilize it in the study area. Based on the responses from the respondent, body pains may be attributed to charcoal production was ranked first (1st) with a weighted mean score (WMS) of 4.4. Experiencing laceration of hands; charcoal production causes injuries and wounds to charcoal producers and rural dwellers and charcoal production and users brings about body odour to users and charcoal producers with a Weighted Mean of Score of 3.5 and were ranked 2nd each. This result implies that the physical structure of the body is negatively affected and damaged due to the production and use of charcoal by the rural dwellers. The smoke that emanate from the use of charcoal was indicated as the major cause of the irritating odour experienced by charcoal producers

and users in the study area and their level of cosmpoliteness that might be connected to their hygienic status might deprived them of the knowledge on how to take good care of their body after the production and use of charcoal.

Furthermore, charcoal production and use causes body irritation to charcoal producers and users; charcoal production and use may lead to burns to charcoal producers and users and experience of running nose due to the use of charcoal were ranked 5th, 6th and 7th with WMS of 3.4, 3.0 and 2.8 respectively. This result is an indication that if proper care is not taken during the production and usage of charcoal, various defects to the body structure and health status might be encountered. In addition, smoke from charcoal may cause respiratory disorderliness (WMS=2.7); charcoal production brings about frequent headache to charcoal producers and users (WMS=2.4) and eye problem is experienced due to the production and use of charcoal with weighted mean score of 2.2 were ranked 8th, 9th and 10th respectively. This result affirms that use of charcoal by rural households affects the health status of the rural people and this might be due to inadequate knowledge about health and safety tips that may guard against the hazardous effects of the use of charcoal for household use.

Lastly, the use of charcoal cause asthma to charcoal users was ranked least (11th) with a weighted mean score of 2.0. This result is an affirmation that respiratory and breathing activity of the heart is in danger from the smoke that oozes out from the use of charcoal, hence the rural dwellers faces more complications from the use of charcoal for energy supply for their daily activity.

Generally, this result affirms that despite the economic gain from the production of charcoal and the usage by the rural dwellers, it still harbors various health challenges that are life threatening with far more economic challenges than using other options available as source of energy. Money spent on the treatment of health challenges encountered with the use of charcoal is far much more than the money to be used to purchase other source of energy for the household use. This result is in consonance with the findings of Eniola and Odebode [1], where the majority (73.9%) of the respondents have negative perception on the effects of charcoal production and usage on the health of the rural dwellers which implies that rural dwellers encounter several health issues with the use and production of charcoal, an indication that control methods to ameliorate effect of charcoal production and usage are not taken into consideration by majority of the rural dwellers. The result affirms the findings of Kato *et al.,* [14], Bailis *et al.,* [9] and WEC [15] observed that health problems, ranging from mild to chronic problems, result from involvement in charcoal production. Charcoal producers experience backache, general exhaustion, chest pains, cough, burns, eye tearing, falling and slipping, cut, crush or lacerations of hand, feet or limbs, back and muscle pain.

Table 3 Distribution of respondents by perceived effects of charcoal production and usage on health of charcoal producers and rural dwellers

Effects of charcoal production on human health	Strongly agree F (%)	Agree F (%)	Undecided F (%)	Strongly disagree F (%)	Disagree F (%)	WMS	Rank
Body pains may be attributed to charcoal production	55 (61.1)	24 (26.7)	-	11 (12.2)	-	4.4	1st
Smoke from charcoal may cause respiratory disorderliness	3 (3.3)	31 (34.4)	2 (2.2)	43 (47.8)	11 (12.2)	2.7	8th
I experience laceration of hands due to charcoal production	10 (11.1)	30 (33.3)	44 (48.9)	6 (6.7)	-	3.5	2nd
I experience running nose due to the use of charcoal	21 (23.3)	15 (16.7)	4 (4.4)	25 (27.8)	25 (27.8)	2.8	7th
Charcoal production causes injuries and wounds to charcoal producers and rural dwellers	25 (27.8)	30 (33.3)	10 (11.1)	19 (21.1)	6 (6.7)	3.5	2nd
Charcoal production and use may lead to burns to charcoal producers and rural dwellers	2 (2.2)	39 (43.3)	9 (10.0)	28 (31.1)	12 (13.3)	3.0	6th

Charcoal production and use brings about body odour to users and charcoal producers	25 (27.8)	34 (37.8)	2 (2.2)	17 (18.9)	12 (13.3)	3.5	2nd
Charcoal production brings about frequent headache to charcoal producers and users	7 (7.8)	23 (25.6)	3 (3.3)	24 (26.7)	33 (36.7)	2.4	9th
The use of charcoal cause asthma to charcoal users	-	13 (14.4)	3 (3.3)	41 (45.6)	33 (36.7)	2.0	11th
Eye problem is experienced due to the production and use of charcoal	13 (14.4)	7 (7.8)	2 (2.2)	33 (36.7)	35 (38.9)	2.2	10th
Charcoal production and use causes body irritation to charcoal producers and users	38 (42.2)	15 (16.7)	-	17 (18.9)	20 (22.2)	3.4	5th

Source: Field Survey, 2021
WMS: Weighted mean score
F: Frequency
%: Percentage

Testing of Hypothesis

Table 4 shows that significant relationship exist between selected socioeconomic characteristics of the respondents such as age (r=-0.285**, p= 0.007), household size (r=0.314**, p= 0.003), years of membership to association (r=-0.375**, p= 0.000), income from charcoal production (r=-0.413**, p= 0.000) and quantity of charcoal produced (r=-0.450**, p= 0.000) and the effects of charcoal production on human health in the study area while years spent in school is insignificantly related to the effects of charcoal production on human health in the study area. This result implies that age, years of membership to association, income from charcoal production and quantity of charcoal produced have inverse significant relationship on the respondents perceived effect of charcoal production meanwhile, household size had a positive influence on the respondents' perception of the effects of charcoal production and use on the rural dwellers. This result is in consonance with the result of Eniola *et al.,* [11] where age, years of experience, income from charcoal production, household size and level of charcoal production all had significant influence on the contribution of charcoal to the livelihood of rural dwellers, this underlines the factor behind the health hazard incurred with the production and usage of charcoal by rural dwellers.

Table 4 Test of significant relationship between some selected socio-economic characteristics and their perception of effects of charcoal production and usage using Pearson Product Moment Correlation Analysis

Socioeconomic characteristics	Correlation coefficient (r)	p-value	Decision	Remark
Year spent in school	0.073	0.491	NS	Accept
Age	-0.285**	0.007	S	Reject
Household size	0.314**	0.003	S	Reject
Years of membership to organization	-0.375**	0.000	S	Reject
Income realized from charcoal	-0.413**	0.000	S	Reject
Quantity from charcoal produced	-0.450**	0.000	S	Reject

Source: Computed data, 2021
NS: Not Significant;
S: Significant **Correlation is significant at the 0.01 level

IV. Conclusion And Recommendations

Majority of the sampled respondents (68.9%) were male, young and active (85.6%) within the age bracket of not more than 50 years with almost all (97.2%) having formal education though with majority having low educational background. Earth mound, pit mound and mud method were the known method used for charcoal production in the study area. Body pain with weighted mean score (WMS) of 4.4 and ranked first; laceration of hands due to charcoal production, injuries and wounds to charcoal producers and users and offensive body odour to both charcoal producers and users were ranked 2nd with each having a WMS of 3.5 each were indicated as major effects of charcoal production and usage on human health in the study area. Significant relationship exists between selected socioeconomic characteristics of the respondents and the perceived effects of charcoal production on health of the respondents. Based on the result gathered from this study, it is recommended that Subject Matter Specialist (environmental extensionist) should be recruited with periodic enlightenment programme to curtail health hazard incurable from the usage and productions of charcoal in the study area.

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