

## Socio-Economics and Health Impact of Quarry Sites on the Surrounding Localities in Ogun State, Nigeria

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### ABSTRACT

Rock quarry provides needed materials used in the road and building construction thus has significant impact on the economy. The aim of this investigation is to look into the socio-economics and health impact of the quarry sites on the surrounding locations in Ogun State. Two hundred copies of structured questionnaire were administered to elicit socio-economic, health, and environmental impact information in eight locations, namely Isara, Igodo, Ilagbe, Baaki Ake, Adelokun, Idode, Ogberere, and Iwaye; while reported diseases data were collected from six Local Government Areas (LGAs) health centres. Data collected were subjected to both inferential and differential statistics using a statistical package for science (SAS 94.0) version. The diseases commonly suffered by the residents were insomnia (34.8 %) Iwaye (Ijebu North east LGA), malaria (63.6 %) Ogberere (Ijebu East LGA), catarrh (40.9 %) Kajola (Owode/Obafemi LGA), skin irritation (46.7 %) Isara (Remo LGA), headache (42.1 %) and cough (31.6 %) Odeda (Odeda LGA),. The environmental impacts of quarrying activities revealed that nearby residents were negatively affected while their economic status was better. In conclusion, the environmental and health impacts of quarrying activities revealed that nearby residents were negatively affected.

**Keywords:** Socio-economics, health, impact, quarry

### Introduction

Quarrying activities have a lot of environmental and health impacts (Hassan, 2022a). This has originated from the methods of operation adopted by the mining companies. The health cost of mining operations sometimes outweighs the benefits gained. In the light of this, Bada and Fagbayigbo, (2009) and

Awudi (2002) have maintained that, despite these negative indicators, the role of the mining company in the economic development of Nigeria and Ghana respectively was a suspect. In Palestine like other countries, rock quarrying industry is a growing and successful industry (Sayara, 2016). The accessible data about these industries in Palestine estimates that there are approximately 300 quarries and 1000

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industries and workshops which yielded over 100 million tons of raw stone. Also, the quarries and factories produce about 25 million square meters of stone per annum (Sayara, 2016). Total investment in the industry was estimated at around \$700 million; thereby making it a major employer of Palestinian capital (15-20,000 direct jobs), with greater proportion than any of the other major Palestinian industries (USAID, 2006). However, there were sixty quarry site in Ogun State as 2017 according to Hassan (2022 b) located in six Local Government Area of state

One of the major adverse effects of quarrying on the environment is the destruction to biodiversity (Anand, 2006; Tanko, 2007; Hassan, 2022a). Biodiversity preservation is important as all species are inter-related, even if this is not immediately visible, or known and our survival depends on this fine balance that exists within nature. Both positive and adverse societal impacts of modern manufacturing technologies have great consequences on economics, health, safety and environment in general (Hassan, 2022a; Anand, 2006).

Mineral exploration, mining and processing have resulted in environmental damages including ecological disturbance, destruction of natural flora, pollution of air, land and water, instability of soil and rock masses, landscape degradation and radiation hazards (Aigbedion and Iyayi, 2007; Darwish 2008). Explosives are employed in rock blasting to extract material for processing; this produces noise and air pollution. Also, it destroys the wildlife's natural habitat. Whilst a quarry is in use, the effects on the local environment are more than just the loss of wildlife's habitats and the noticeable visual impact (Umeham, 2001). In most cases, there will be a need to take out the soil and overburden to expose the mineral. The mineral will need to be dug out and then transported from the quarry site for further processing or direct use. These activities require the use of powered machinery for excavation and transportation of materials within the

site (Umeham, 2001; Sayara, 2016). Processing plant, on site can often include the use of crushing and grading plant. There will also be noise generated from the blasting of rock. Vibrations and noise pollution are associated with many types of equipment used in quarries and stone cutting industries operations, but blasting is considered the major source (Fedra *et al.*, 2005; Sayara, 2016). Vibration affected the stability of infrastructures, buildings, and houses of the residents living close to these working sites (Akabzaa and Darimani, 2001; Ekechukwu, 2010; Sayara, 2016).

Oyinloye and Ajayi (2015) opined that it is quite obvious that air pollution is the major environmental problem experienced in Oba-Ile quarry site in Ondo State. Melodi (2017) reported that the use of toxic materials and long period of mining were the identified causes of land degradation and pollution while there have been some attempts by the government or company to reduce the environmental impact of mining. The pollution produced from quarry activities affect the health of people living very close to the site thereby making live difficult to the residents (Ugbogu *et al.*, 2009; Oyinloye and Ajayi, 2015).

Oguntoke *et al.* (2009) and Nartey *et al.* (2012) reported that the data collected from hospital records of quarry workers portrayed their health profile while the prevalent health problems of the nearby residents were elicited from questionnaire surveys conducted in two selected neighbouring communities of quarries in Abeokuta (Nigeria) and Ghana respectively. Although, the residents of neighbouring communities were aware of risks associated with living near quarry sites, their general low socio-economic status made them incapable of taking any decisive measure towards relocating elsewhere (Oguntoke *et al.*, 2009).

Nartey *et al.* (2012) reported that there was rise in cough, pneumonia, chest pains, common cold, eye problems, ear infection, malaria, gastro-intestinal and other respiratory tract infections like catarrh, sore throat from 2005 to 2010 by the people living

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close to quarry at Oborpa clinic in Ghana. Nartey *et al.* (2012) compared the health status of the respondents before and after the inception of the quarrying activities and concluded that, the health status of the average respondent suffered some deterioration as a result of the limestone extraction. Hassan (2022a) opined that the quarrying had brought about both benefits and costs to Kemta Logemo village (Abeokuta, Nigeria). The benefits include employment creation, and raised the economic status of the people living close to the quarry. In the light of this foregoing; an investigation was conducted on socio-economics and health impact of quarry sites on the surrounding localities in Ogun State.

**Materials and Methods**

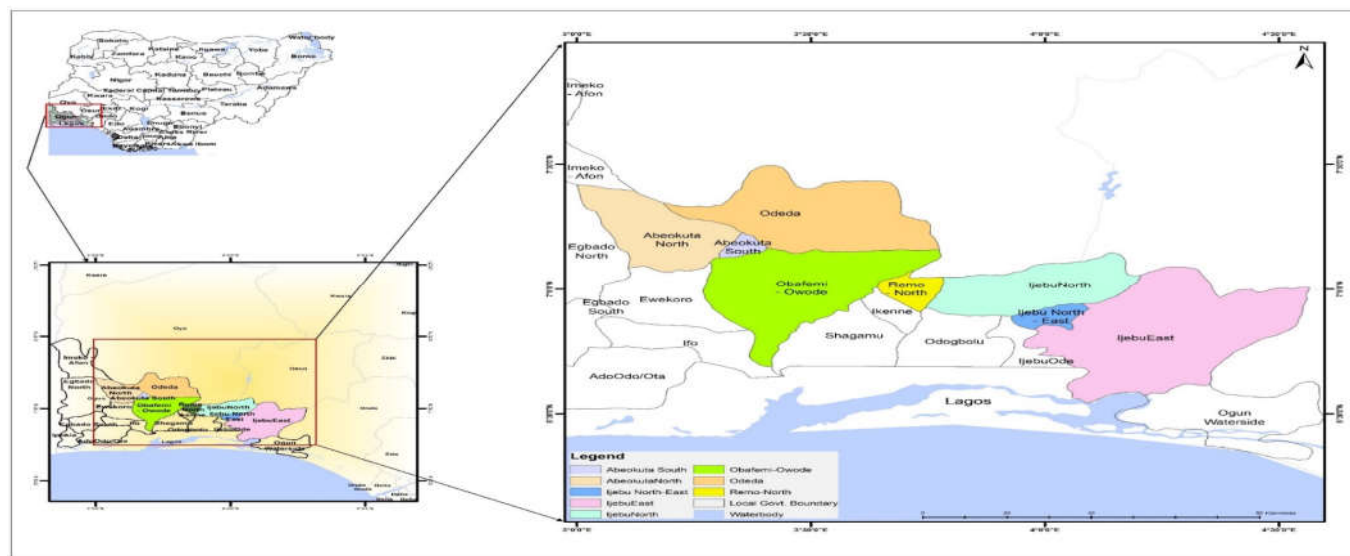
**Study Area**

Ogun State lies between latitude 7.9031 and 6.3142 N to longitude 2.7073 and 4.5750 E. It is very close to Lagos, the commercial capital of Nigeria. Ogun State covers a landmass of 16,980.55 square kilometres with a population of about 3,751,140 (NPC, 2006) and within the Rain forest zone of Nigeria. It has a tropical climate with separate wet and dry seasons. Wet season in Ogun State lasts

between seven and eight months; (April to October) and the dry season running through November to February (Hassan, 2022b). Quarrying is less capital intensive compared to mineral extraction. Quarry is widespread in Ogun state and cut across eight Local Government Area (LGAs) within three divisions (Egba, Ijebu and Remo) of ethnic and cultural line. Figure 1 shows the locations of quarry sites in the LGAs of Ogun state.

**Sampling techniques**

Purposive sampling method was used to select eight (8) quarry locations in the study area. Sampling was carried out in eight (8) selected locations communities due to their closeness (500 – 1000 m) to the quarry sites in all six Local Government Areas (LGAs). Two (2) locations were selected from each of Odeda and Obafemi/Owode Local Government Areas due to the presence of higher number of quarry sites in them. One location was sampled from each of the remaining four (4) Local Government Areas. The administration of questionnaire to surrounding communities and obtained the secondary data from health centres in each sampling LGA about health status of the residents living close to quarries.



**Figure 1:** Map of quarry sites Local Government Areas in Ogun State  
Source: Hassan (2022 b)

**Table 1:** Selected quarry sites in Ogun State

Local government area	Locality or village	Industry	Long(E)	Lat(N)
Ijebu East	Ogbere	Julius Berger	3.557	6.889
Ijebu North East	Iwaye	Paras	3.631	7.175
Ijebu North	Idode	CCECC	3.4230	7.138
Remo North	Isara	CCECC	3.534	7.155
Odeda L.G	Igodo	F.W.S.AN.H.Concept 2	3.492	6.931
Odeda L.G	Ilagbe	DLK	3.553	6.931
Obafemi/Owode	Baaki ake	Blaco	3.625	7.119
Obafemi/Owode	Adelokun	Zanex	4.070	6.965

Source: Hassan (2022 b)

### Questionnaire administration

Copies of questionnaire were administered to the people living and working around the quarry sites so as to elicit their opinion on the socio-economic and health impact of quarry activities. Questionnaire was administered in the villages/hamlets close to the quarry sites. A total of five hundred (500) respondents were proposed to be sampled in all the eight (8) selected locations; which means fifty (50) respondents per location. At the end of the survey only two hundred and twenty (220) questionnaire were given out and two hundred (200) were retrieved. The presence of few people in each community informed the reduction in the number of respondents.

The themes that are included in the questionnaire are as follows

Section A Demography characteristics of respondent

Section B: Environmental impact of quarry activities

Section C: Health impact of quarry activities

Section D: Economic livelihood impact of quarry activities

Accidental sampling technique was used; such that every individual came across was given

questionnaire so as to sample their opinions on the above listed themes.

### Data analysis

Data were subjected to both descriptive (mode, means percentage and range) and inferential analysis (ANOVA, T-test and Correlation coefficient. All the above statistical analyses were carried out using Statistical Package for Sciences (SAS 9.4 version)

### Results and Discussion

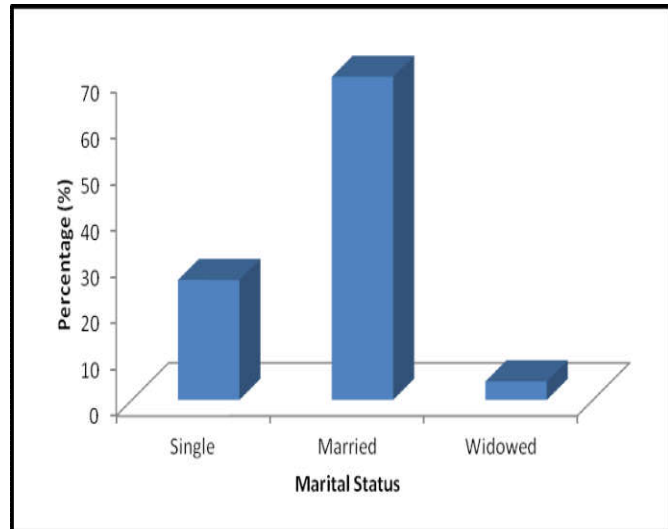
**Table 2:** Distribution of Respondents among Communities near Quarry Sites

Location (LGA)	Frequency	Percent
Baaki Ake (Obafemi/Owode)	22	11.0
Isara, (Remo)	36	18.0
Igodo (Odeda)	16	8.0
Ilagbe (Odeda)	16	8.0
Ogbere (Ijebu East)	40	20.0
Iwaye (Ijebu North East)	26	13.0
Idode (Ijebu North)	20	10.0
Adelokun (Obafemi Owode)	24	12.0
Total	200	100.0

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**Table 3:** Age and Sex distribution of respondents

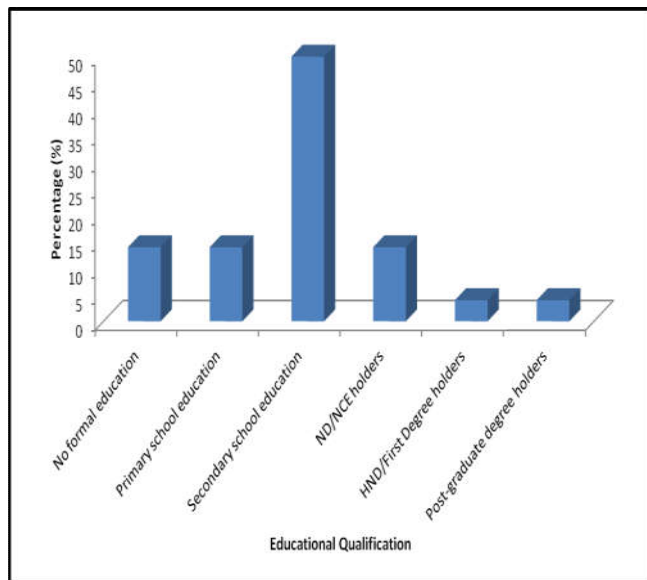
Age group	Frequency	Percent	Cumulative Percent
20-29	56	28.0	28.0
30-39	80	40.0	68.0
40-49	32	16.0	84.0
50-59	16	8.0	92.0
60-69	16	8.0	100.0
<b>Total</b>	<b>200</b>	<b>100.0</b>	
<b>Sex</b>			
Male	140	70.0	70.0
Female	60	30.0	100.0
<b>Total</b>	<b>200</b>	<b>100.0</b>	



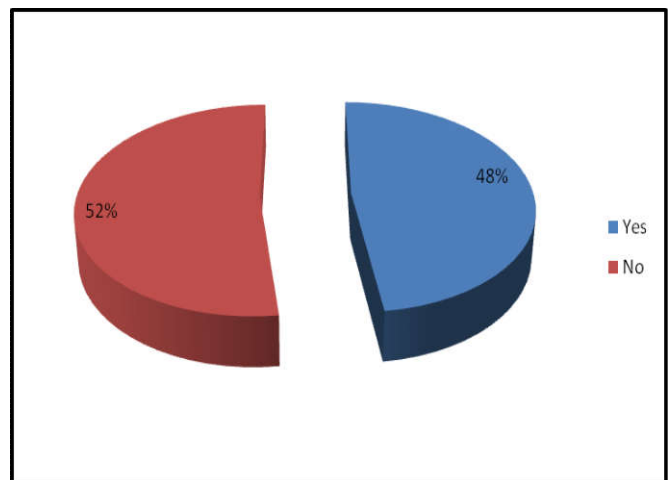
**Figure 3:** Marital status of respondents

**Table 4:** Respondents' household size and length of stay at a quarrying site

	Minimum	Maximum	Mean	Std. Deviation
Household size	4	7	5.0	1.069
Length of Stay at a Quarrying Site (Years)	1	60	9.7	11.916



**Figure 2:** Educational Background of Respondents



**Figure 4:** Length of stay of respondents in the area

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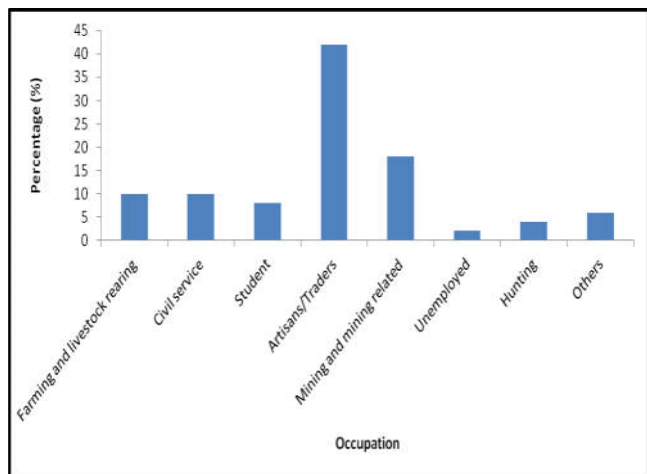


Figure 5: Occupational status of respondents

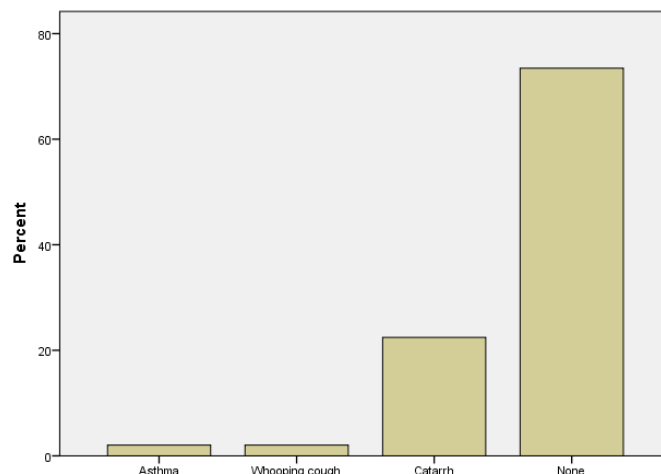


Figure 8: Diseases suffered among people living close to quarry sites (1)

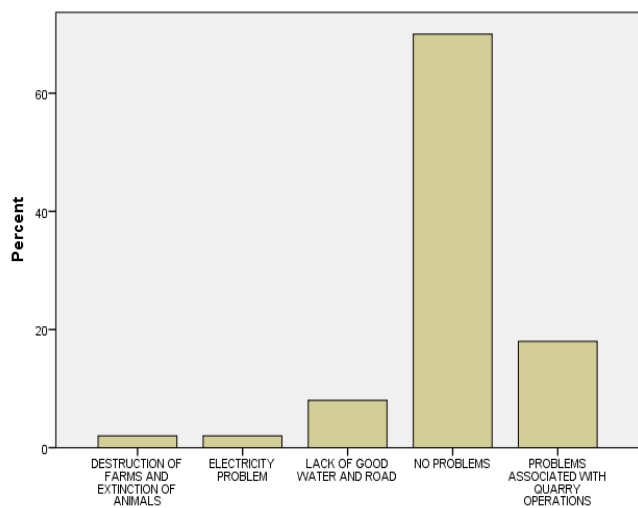


Figure 6: Problems encountered living close to quarry

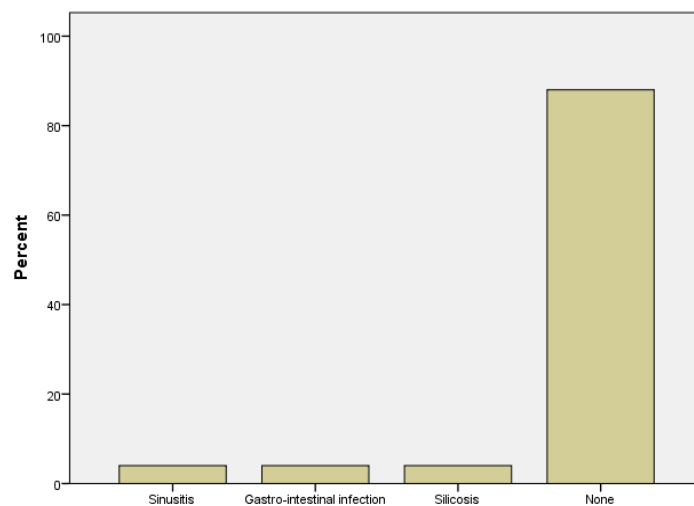


Figure 9: Diseases suffered among people living close to quarry sites (2)

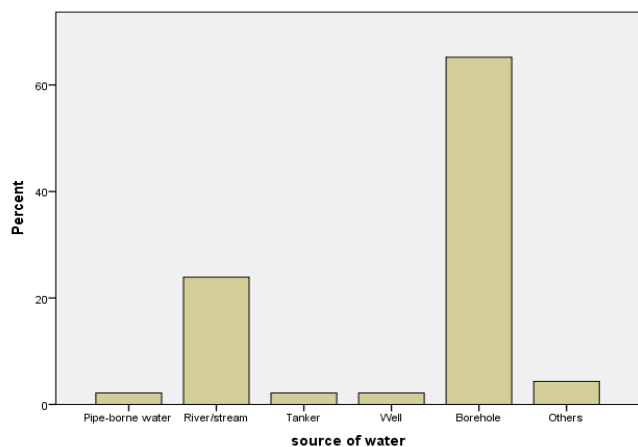


Figure 7: Source of water in the localities around quarry

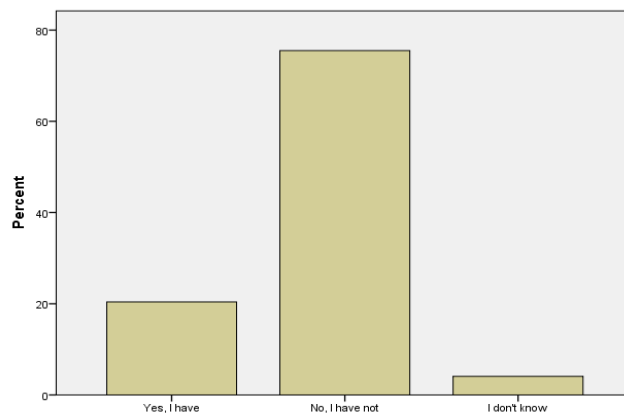
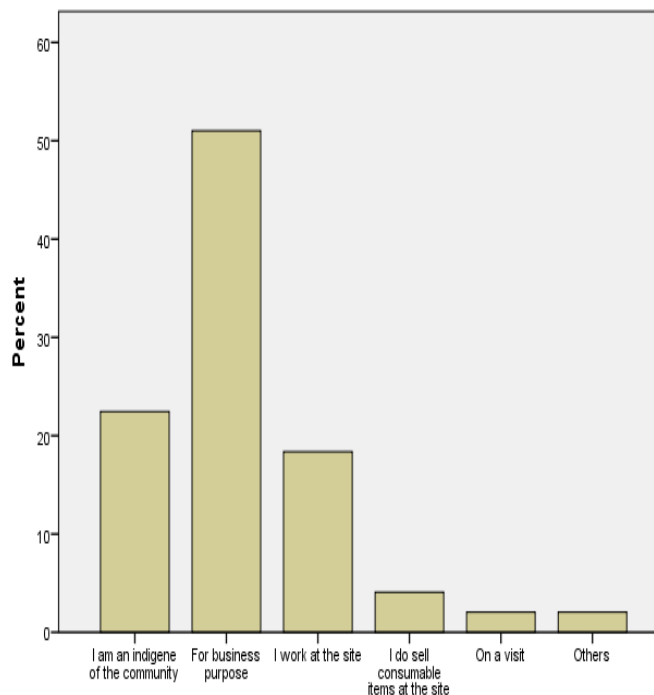
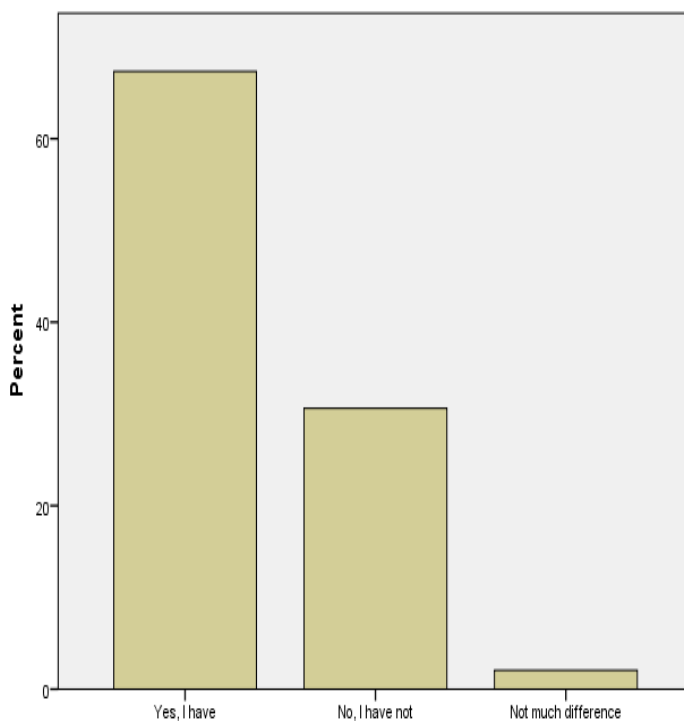


Figure 10: Considering moving away because of environment or health challenge

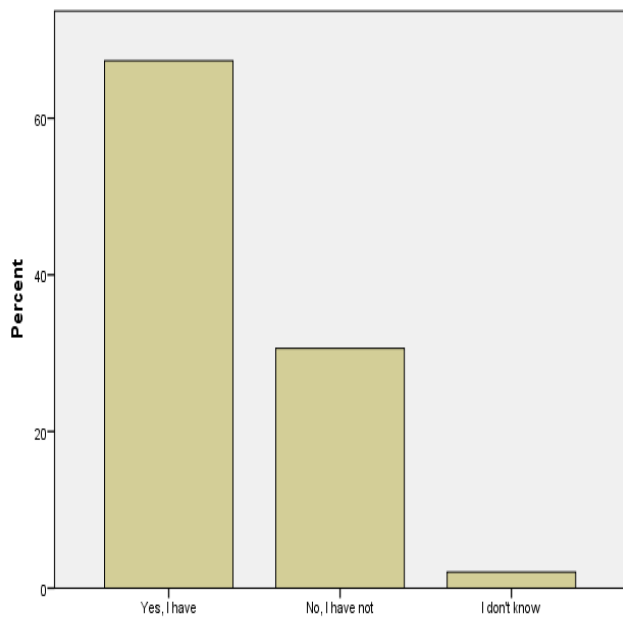
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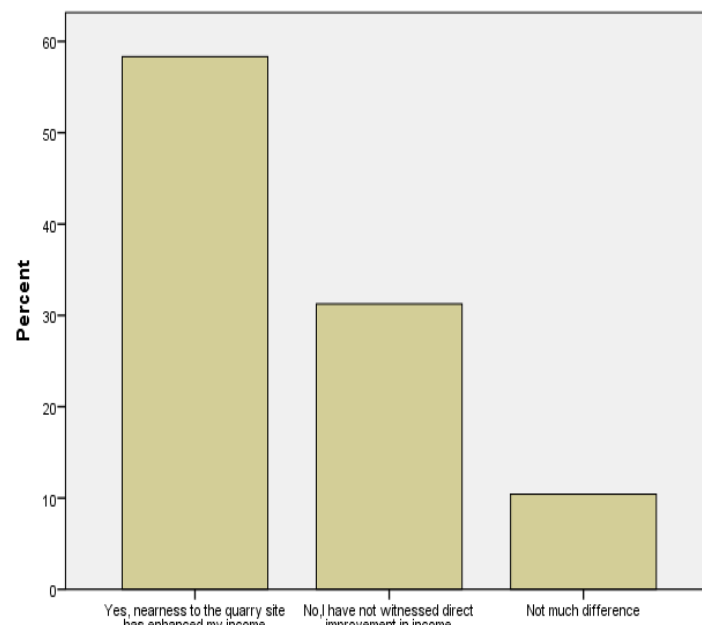
**Figure 11:** Reason people live close to quarry sites



**Figure 13:** Benefit derived from quarry activities in your community



**Figure 12:** Experience increase income level due to quarry activities



**Figure 14:** Enhanced income as a result of nearness to quarry sites

**Table 5:** Responses to community environmental issues

S/N	Community environmental issues	Very serious (%)	Serious (%)	Moderate (%)	Present but insignificant (%)	Absent (%)	Non Response (%)
1.	Degrade farm land and landscape	24 (12)	20 (10)	56 (28)	48 (24)	24 (12)	28 (14)
2.	River Siltation/farm flooding	12 (6)	16 (8)	60 (30)	44 (22)	48 (24)	20 (10)
3.	Pollution of water sources	28 (14)	16 (8)	56 (28)	28 (14)	52 (26)	20 (10)
4.	Noise from trucks and quarry	56 (28)	52 (26)	56 (28)	12 (6)	4 (20)	20 (10)
5.	Vibration from stone blasting and crushing	72 (36)	36 (18)	48 (24)	16 (8)	0 (0)	28 (14)

**Table 6:** Responses to health problems in community

S/N	Item	Yes (%)	No (%)	I don't know (%)	Non-Response (%)
i	Quarrying activities affect the health of people living around the site	52 (26)	128 (64)	16 (8)	4 (2)
ii	Based on your experience living/working in the area, have you ever noticed health problems?	48 (24)	128 (64)	20 (10)	4 (2)

**Table 7:** Health problems of living around the quarry

S/N	Item	Yes (%)	No (%)	I don't know (%)	Non-Response (%)
i	Has there ever been situation of water contamination in your area?	36 (18)	144 (72)	12 (6)	8 (4)
ii	Have you ever experienced difficulty in breathing?	40 (20)	148 (74)	0 (0)	12 (6)
iii	Have you ever experienced continuous headache?	44 (22)	144 (72)	4 (2)	8 (4)
iv	Have you ever experienced severe hearing loss?	32 (16)	152 (76)	4 (2)	12 (6)
v	Have you ever experienced sleeping problems?	48 (24)	140 (70)	4 (2)	8 (4)
vi	Have you ever experienced problems when communicating?	40 (20)	148 (74)	0 (0)	12 (6)



**Table 8:** Symptoms experienced during past month because of quarry activities

S/N	Item	Never (%)	Between 1 and 5 times (%)	5 times or more (%)	Everyday (%)	Non Response (%)
4646	1. Difficulty in breathing	156 (78)	24 (12)	0 (0)	0 (0)	20 (10)
	2. Severe cough	120 (60)	52 (26)	0 (0)	4 (2)	24 (12)
	3. Muscle or joint pain	96 (48)	64 (32)	8 (4)	8 (4)	24 (12)
	4. Memory or concentration problems	156 (78)	16 (8)	4 (2)	4 (2)	20 (10)
	5. Severe headaches	132 (66)	36 (18)	4 (2)	8 (4)	20 (10)
	6. Nausea	144 (72)	16 (8)	4 (2)	4 (2)	32 (16)
	7. Vomiting	164 (82)	8 (4)	8 (4)	4 (2)	16 (8)
	8. Skin irritation	128 (64)	28 (14)	8 (4)	16 (8)	20 (10)
	9. Problem of sleeping	128 (64)	36 (18)	4 (2)	8 (4)	24 (12)
	10. Weakness or exhaustion	124 (62)	40 (20)	4 (2)	12 (6)	20 (10)

**Table 9:** Correlation among environmental, health and economic livelihood impact of quarry activities

	Environmental impact	Health impact	Economic impact
Environmental impact	1.00		
Health impact	-0.08 (0.41)	1.00	
Economic impact	0.039 (0.62)	0.1 (0.08)	1.000
p < 0.05 is significant	p > 0.05 is not significant		

**Table 10:** Linear Relationship of environmental, health and economic livelihood on decision to move away from quarry sites

Dependent variable: Moving away	B	t-test	P-value
(Constant)	1.421	3.143	0.002
Environmental impact of quarrying activities	-0.246	-5.302	0.000
Health impact of quarrying activities	0.606	3.248	0.002
Economic impact of quarrying activities	-0.002	-.028	0.978
R = 0.529; R <sup>2</sup> = 0.28; Model P-value = 0.000; MSE = 0.14			

R = Coefficient correlation, R<sup>2</sup> = Coefficient of determination, MSE = Mean square error

**Table 11:** Reported cases of health problems at the health centres

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Health centre location	Disease	Occurrence of Health Problems	
		Frequency	Percentage (%)
Kajola (Owode/Obafemi LGA)	Cough	6	27.1
	Malaria	7	31.8
	Catarrh	9	40.9
	Catarrh	5	26.3
Odeda( Odeda LGA)	Cough	6	31.6
	Headache	8	42.1
Ogbere (Ijebu East LGA )	Malaria	7	63.6
	Headache	4	36.4
	Insomnia	8	34.8
Iwaye (Ijebu North east LGA)	Malaria	9	39.1
	Headache	6	26.1
	Malaria	8	53.3
	Skin irritation	7	46.7
Isara (Remo LGA)	Pain	6	23.1
	Headache	7	26.9
	Malaria	6	23.1
Idode( Ijebu north LGA)	Cough	7	26.9

## Discussion

Table 2 presents the distribution of respondents among communities around quarry sites. Most of the respondents live in Ogbere village in Ijebu East LGA; where Julius Berger was sited. However, other locations also had their fair share of the total respondents sampled and their voices and opinions were aired on how quarries affected their socio economic status.

Table 3 presents the age and sex of the villagers interviewed during the study. Most of the respondents fell within the age group 30 – 39 (40 %), while the lowest portion of the respondents were in the 60 – 69 age bracket (8 %). Most of the respondents were male (70 %), while female formed only 30 % of the interviewed individuals. This finding is similar to that of Oyinloye and Ajayi (2015). These set of people were the active proportion of the population who were likely to bear the

adversative effects of quarry activities. The young and the old ones rely on these set of people for their livelihood. Any adverse impact of quarry on this set of people will surely have backlash effects on the social and economic life of the general populace.

Figure 2 shows that 14 % of the respondents have no formal education, another 14 % have only primary education, 50 % have secondary education, 14 % have ND/NCE education, 4 % have HND/BSc education while the remaining 4 % have postgraduate degree. It can be deduced from the bar chart that most of the respondents had secondary school education; and as such are literate. Only 14 % had primary school education and can read and write. The 14 % of respondents that were not educated but they were with their senses and know what was going on around them. However, after introduction and interpretation of the subject matter to them. They were able to answer the questions posed to them and gave

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their opinions on subject matter. However, it is comparable to Hassan (2022a).

Figure 3 shows that 26 % of the respondents were singles, 70 % were married; while the remaining 4 % were widowed. Table 4 shows that there are minimum of 4 persons in a respondents's household and a maximum of 7 persons in a respondent's household. On the average, there are 5 persons in a respondent's household. Hence, their views were aired through their representatives. Table 4 also shows the year of residency. The minimum number of years that the respondents had stayed in the quarrying area was over a year; while the maximum was 60 years. The average length of stay of a respondent around the quarry site was about 10 years. These years of stay come to play in the areas of assessing the impact of quarry activities on socio-economic and health wellbeing of the people living close to quarry sites.

Figure 4 depicts that 48 % of the respondents were indigenes of the community where the quarrying activities were taking place, while 52 % are non-indigenes. The ratio is almost 1:1, meaning that both indigenes and non-indigenes balanced each other. Their responses may not be biased with respect to the company carrying out the quarry activities. However, the issue of environment go beyond indigeneship of a locality; as the effect of environmental degradation affects everybody.

Figure 5 demonstrates that most of the respondents were artisans or traders, which accounts for 44 % of the total respondents. These set of respondents either selling food, and consumable to workers at quarry sites or members of the neighbouring communities or engaging in one vocational job or the others. Whereas some are reliant on the quarries for their daily sustenance and some are not.

Mining and mining-related activities accounted for 20 %. It appears these set of respondents are directly or indirectly working in the quarry factories. Although they are likely to be biased for fear of losing their jobs or daily bread; their opinion matter nonetheless. However, their percentages were infinitesimal compared to the remaining percentages of other occupations. The occupation of people living close to quarries was farming and livestock rearing, and was 10 %; the set of respondents would indicate quarries impact from the point of dust and noise generated; that stained the grasses which their animals feed on and farm produces. The noise could cause shock for them and their animals. However, civil servants was 10 % that were likely to be enlightened workers by virtue of working with government; though, some might not be educated. Students were almost 8 %; these are set of enlightened and educated but unemployed looking forward to coming out of school and seeking gainful employments. Hence, their views on subject matter are very important. Hunter's constituted 5 % of the occupation groups. They were at the receiving end of the quarry activities; because once the quarry activities started, the noise generated alone was enough to chase the wild animals away and never to return; on which their sustenance were based (Umeham, 2001 and Anand, 2006). Hence the hunters were worst for the quarry activities; thus, likely to be biased.

Table 5 illustrates the environmental impact of quarry activities in areas where they were located; such as vibration from stone blasting and crushing activities, with 36 % respondents saying that it was very serious, 18 % admitted that it is worse; and 24 % of respondents agreed that the noise generated were moderate. Hence, it can be inferred that vibration from stone blasting and crushing activities had adverse effect on the people. Hassan (2022a) reported that like many other man-made activities (anthropogenic factors), quarry activities caused significant impact on the environment. Disturbance due to

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movement of long vehicle/heavy trucks had 28 % respondents admitted that it was a very serious matter. In addition, 28 % alleged that vehicular movement problem was moderate. It can be deduced from these responses that disturbance due to movement of long vehicle/heavy trucks posed a serious challenge around quarries. According to Umeham (2001), the noise impact of quarry mining arose from the earth moving machines and equipment, power generating sets, and vehicular traffic. River siltation/farm flooding was identified by 6 % of respondents as a very serious problem. Exactly 12 % of respondents agreed that degradation of farmland and landscape was worst, 10 % of respondent concurred that it was a serious matter, while 28 % stated that it was moderate. Hence, it can be said that quarrying moderately or fairly degraded farmland and landscape. Melodi (2017) reported that 91 % of the respondents noted that environmental problems like land degradation and pollution (including air, water and noise pollution) are associated with mining activities in their respective communities. Moreover, regarding the pollution of water sources, 14 % of the respondents alleged that it was very serious, 8 % said it was serious, 28 % said moderate, 14 % said present but insignificant, 26 % admitted that it was absent and 10 % chose to give no response. This implies that quarry activities fairly pollute water sources around the quarries. According to Melodi (2017), water pollution was identified as an after - effect of the surface mining in the study area.

Figure 6 shows that 2.0 % of the respondents admitted that the major problems they face as a result of quarry activities is destruction of farms and extinction of animals; 2.0 % of these respondents have electrical problems in their area, 8.0 % do not have access to good water and roads in their community, 70.0 % do not have any problem in their community, while 8.0 % have problems arising from quarry activities like noise, dust and so on. The analysis shows that

most of the respondents do not have problems in their community as a result of quarry activities in their area. However, Melodi (2017) reported that the use of toxic materials and long period of mining were identified causes of land degradation and pollution.

Table 6 shows the health impact of quarry activities in the areas under investigation, 64 % of the respondents alleged that quarry activities do not affect the health of people living around the sites. Judging from the responses, it can be deduced that quarry activities was not perceived to affect the health of the people living around the quarries. Also shows that 64 % of the total respondents had not taken cognisance of any health problem arising from their close proximity to the quarries. Whereas, 10 % admitted that they do not know whether they have health challenges or not, while 2 % gave no response. However, from the response outlined above; it can be inferred that living or working close to the quarries does not necessarily cause any health challenge. According to Nartey *et al.* (2012) reported that the health of people living close to quarry were fair.

Figure 7 shows that 66.2 % of the respondents had access to boreholes in their communities, 23.9 % make do with river/stream as their sources of water; while 4.3 % had other sources of water like sachet water etc. The main source of water supply for the peoples living around quarry sites was borehole water.

Table 7 presents the problems associated with living around quarrying sites. About 72 % of respondents admitted that they have never had water contamination in their area; whereas other options available on questionnaire were not up to 72 % . Hence, it can be inferred that there were never a time quarries contaminate the surrounding water sources contrary to the report of Darwish (2008) who posits that the removal of top soil and surface rock strata can increase the vulnerability of groundwater to contamination.

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About 74 % of the total respondents admitted that they do not experience difficulty in breathing, while Only 20 % of the respondents concurred that they experience difficulty from breathing. The responses can be inferred that the larger percentage of peoples living around quarries do not experience difficulty in breathing. Inhalation of dust resulting in respiratory tract infections also adds to the list of the negative effects of quarrying in the Lower Manya Krobo District in Ghana (Nartey *et al.*, 2012). Seventy-two percent of the respondents claim that they have not experienced persistent headache. Hence, it can be stated that people do not necessarily experience continuous headache as a result of living around the quarries. Nartey *et al.* (2012) reported that among other significant diseases that had seen major increase in percentage was headache due to quarrying activities. Respondents (76 %) claim not to suffer hearing loss. Hence, it can be inferred that people do not experience any hearing loss irrespective of their close proximity to the quarries. The rise in ear infection may be due to the high levels of noise from machinery and trucks especially among quarry workers (Nartey *et al.*, 2012). Approximately 70 % of respondents did not report experiencing sleeping problem, while 24 % admitted that they contend with sleeping problem. The responses showed that living close to the quarry does not necessarily cause sleeping problem for the residents. Umeham (2001) asserted that noise pollution from the extraction process for any material caused sleep loss. About 74 % of respondents indicated that they had no problems with communicating with other people. This implies that their exposure to the noise emission does not affect them by causing communication impairment. Noise as a result of quarry processes caused hearing loss (Umeham, 2001).

Table 8 shows some health effects of quarry activities in areas where they were located. The frequency of occurrence of health issues among

the respondents during the past months were analysed. Regarding health challenges like difficulty in breathing, 78 % of respondents alleged that they never experienced it in the past month; 12 % said they experienced it between 1 and 5 times. Hence it can be inferred that difficulty in breathing was not rife among residents in the past months irrespective of the fact that they live close to the quarries. Occurrence of respiratory problems among manual stone-quarrying workers had been reported by Ugbogu *et al.* (2009).

Concerning severe cough, 60 % of the total respondents alleged that they never have it during past months. About 26 % admitted that they experienced it between 1 and 5 times; while 12 % chose to be mute on the matter. However, from the statistics, it is quite clear that residents do not necessarily experience cough irrespective of the fact that they live close to the quarry sites. Nartey *et al.*, (2012) reported the increase in cough occurrence from 33 to 100 % in study area after the inception of the quarry activity. Concerning muscle or joint pain, 48 % respondents indicated that they never experience it; 32 % admitted that they only experienced it between 1 and 5 times. Whereas 12 % chose to be mute on the matter. However, people do not have muscle or joint pain because they were living close to quarry sites (Oyinloye and Ajayi 2015). Respondents (78 %) alleged that they never experience memory or concentration problems as a result of quarry activities; while 10 % opted to keep mute on the matter; from the foregoing, it is deduced that quarry activities does not necessarily cause memory or concentration problems for the people living close to the quarries. Umeham (2001) reported that noise emanating from quarry activities can cause distraction and productivity loss. More so, 66 % of the total respondents alleged that they never experienced severe headaches; while 18 % admitted to have experienced severe headaches between 1 and 5 times in the past months. About

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10 % provided no responses. In a nutshell, it can be deduced that quarry activities does not cause headache for people living close the quarries. Headache was among the disease suffered by persons living close to quarry in Ghana (Nartey *et al.*, (2012).

Concerning nausea, 72 % of the total respondents alleged that they have never experience it; 16 % provided no responses on the matter. Hence, it can be said that quarrying does not cause nausea for people residing close to the quarry sites. However, Oyinloye and Ajayi (2015) opined pollution produced from quarry activities affect the health of people living very close to the site thereby making life difficult for the residents. Vomiting is another disease that people living close to the quarry sites are susceptible to; 82 % of respondents alleged that they never experience it; while 8 % provided no responses. Therefore, it can be deduced that vomiting is not as a result of residing close to quarries (Oyinloye and Ajayi, 2015). Regarding skin irritation; 64 % of the total respondents stated that they never experienced it. About 14 % admitted to have experienced it between 1 and 5 times; 4 % said they experienced it 5 times or more, 8 % revealed that they experienced it everyday, while 10 % chose not to provide any responses. It is deduced that skin irritation is not caused by quarry activities. Ugbogu *et al.* (2009) reported skin problems among manual stone-quarrying workers. Regarding sleeping problems, 64 % of the respondents indicated that they had never experienced it; 18 % claimed that they experienced sleeping problems between 1 and 5 times; while 24 % chose to provide no responses. This shows that sleeping problems is not necessarily caused by quarry activities. Noise pollution from the extraction process for any material can cause sleep loss (Umeham, 2001). Finally, concerning weakness or exhaustion, 62 % claimed that they have never experienced it in the past months irrespective of the fact that they live close to quarries. About 6 % admitted

to having weakness or exhaustion everyday while 10 % chose to provide no response. Hence, it can be infered that quarrying does not cause weakness or exhaustion for people living close to the quarry sites. According to Umeham (2001), noise from the quarry causes stress and high blood pressure.

Figure 8 indicates that 2 % of the respondents had suffered from asthma. About 2 % stated that they had also suffered from whooping cough, while 22.5 % admitted to have suffered catarrh. More so, 73.5 % they had not suffered from any of these diseases. The analysis shows that most of the respondents were free from asthma, whooping cough and catarrh. Hence, quarrying is not a causative agent of these diseases in locations where quarries are sited. Oguntoke *et al.* (2009) reported that the prevalent health problem of the nearby residents that was derived from a questionnaire survey conducted in two selected neighbouring communities of quarries were shock (46.0 %), nasal infection (29.2 %), cough (26.0 %).

Figure 9 shows that 4 % of the respondents had suffered from sinusitis, 4 % alleged that they have suffered gastro-intestinal infection while 4 % indicated that they had suffered from silicosis; while 88% stated that they have never been diagnosed of any of the diseases. The analysis shows that most of the respondents were free from sinusitis, gastro-intestinal infection and silicosis. However, all the diseases listed have equal probability of occurrence or prevalence rate in the areas occasioned by quarry activities. Hence, quarrying cannot be said to be the cause of these diseases among people living close to the quarry sites. Similarly, Oyinloye and Ajayi (2015) reported case of prevlence of throat infections, cough or catarrh, heart diseases, and chest aches.

Figure 10 shows the respondents' disposition to the quarry environment or health challenge experienced. The large fraction (74 %) of the

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respondents considered staying despite the environmental and health problems, they experience around the quarry sites. However 20 % of the respondents chose to move away. This data suggested that people are not willing to move out of their ancestral home despite the adversative effects of quarry activities (Awudi, 2002).

Figure 11 depicts that 22.4 % of the respondents lived close to quarry sites because they were indigenes of the community, 51 % because of business purposes, 18.4 % because they worked there, 4.1 % because they sold consumable items at the site, 2 % because they came for a visit, while 2 % lived close to quarry sites due to other reasons. The analysis shows that the most reason why people lived close to quarry sites was because of business purposes.

Figure 12 illustrates that 67.3 % of the respondents had experienced increase in income level compared to the time preceding quarry activities, 30.6 % had not experienced increase in income level, while 2 % were unsure whether they have experienced increase in income level. The analysis shows that most of the respondents had experienced increase in income level compared to the time preceding quarry activities. Awudi (2002) had maintained that, despite negative indicators of quarry, the role of the mining industry in the economic development of Ghana cannot be ignored.

Figure 13 shows that 67.3 % of the respondents had benefitted from quarry activities; 30.6 % had never benefitted from quarry activities, while 2 % were unsure whether they had been benefitted or not from quarry activities. However, from the analysis, it can be deduced that most of the respondents had benefitted from quarry activities. Hence, quarrying improves the economic status of people living close to the quarry sites. In Palestine like other countries, stone and marble industry is a growing and successful industry (Sayara, 2016).

Figure 14 demonstrates that 58.3 % of the respondents had enhanced income as a result of their nearness to quarry sites, 31.3 % did not have enhanced income while 10.4 % respondents said that they had not observed much difference in their income level. However, most of the respondents had actually experienced enhanced income since quarry activities commenced in their communities (Bada and Fagbayigbo, 2009).

Table 9 shows the Spearman's rank correlation coefficient ( $r$ ) of environmental, health and economic livelihood impact of quarry activities. There exist in a negative or weak correlation between environmental and health impact ( $r = -0.08$ ,  $p < 0.05$ ). This indicates that the impacts of the quarry activities on the environment have direct consequence on human health. For instance, dust generated by quarry activities may negatively affect health in terms of catarrh, respiratory diseases etc. The correlation between environment and economic livelihood impact is positive but weak ( $r = 0.039$ ),  $p < 0.05$ ). This implies that quarry activities in the locations have direct consequence on the economic status of people living around quarry sites. Also, it implies that it improved their economic wellbeing as well. The correlation between health impact and economic impact is ( $r = 0.1$ ,  $p > 0.05$ ). This indicates that the impact of quarry activities on people's health does not directly affect their economic status. This means that despite the depreciation of their health, people living around quarry are experiencing improved economic wellbeing (Bada and Fagbayigbo, 2009; Awudi, 2002).

Table 10 shows linear relationship of environmental, health and economic livelihood on decision to move away from quarry sites. The analysis shows people are not ready to relocate away from quarry sites because of the environmental impacts of quarry activities. It was observed that they are not willing to move away from the quarry sites because of their

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economic livelihood was improved by the quarry site and its operation. However, some people are ready to move away from quarry sites due to the effect of quarrying activities on their health. Environment and health impacts of quarry activities on residents' decision to move away from quarry sites were very significant, while that of economic livelihood is not significant, because they would not move away from quarry sites, even if they are presented with other income sources. In all, 28 % of the total variations in decision to either move away from quarry sites or stay put depends on the variations in the environmental, health and economic impacts of quarry activities on the residents. The reported cases of health problems among the residents close to the quarries are presented in Table 11. In Owode /Obafemi LGA, the records at the Kajola health centre revealed that catarrh (40.9 %) was the most prevailing ailment among the diseases observed in residents. Headache (42.1 %) among Odeda LGA residents close to quarry. Ijebu East LGA health centre observed malaria (63.6 %) as the most frequent disease. In Ijebu North East LGA health centre, malaria (39.1 %) was recorded as the most occurring ailment among the residents living close to quarries. Among the Remo LGA residents close to quarry site, the health centre recorded 53.3 % of malaria, 46.7 % skin irritation and 23.1 % pain. The most prevalent disease among residents in Ijebu North LGA health centre was headache (26.9 %) and cough (26.9 %) among the residents close to quarry site (Nartey *et al.*, 2012; Oguntoke *et al.*, 2009).

### Conclusion

This study has assessed the impact of quarrying activities on the socio-economic and health wellbeing of the people around the quarry sites. The diseases residents around quarries always diagnosed of; at health centres were cough, catarrh, insomnia, skin irritation, headache, malaria and pain. The environmental impact of

quarrying activities was negative and significant; economic livelihood impacts was negative and not significant; while health impact was positive and significant on the decision to move away from quarry sites by the residents.

Though the economic livelihood of the people living close to the quarry improved but failed in the health and environmental impact. However, Environmental Impact Assessment (EIA) is not yet a practice or culture accepted by the quarry operators in Ogun state, because most quarries visited have not for once place any mitigation in place to cushion the effect of their activities on the environment. This is because there was increase in sand dust generated along the road leading to quarry. This signifies gross pollution of the soil, air and vegetation. Hence, compliance and monitoring agencies should be proactive, so as to visit quarry sites and make sure that there is compliance of policy guiding their operations and their negative impacts on the environment. So that any err or flaunting company will be punished or prosecuted.

**Conflicts of interest:** None to declare.

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