

Research Article

Exploring the usage of and type of Personal Protective Equipment(PPE) amongst women ASM

Kenneth Okello Olwo¹ 

¹Collaborative Efforts to Alleviate Social Problems (CEASOP), Lira City, Uganda

Corresponding Author: jago.oyer@gmail.com

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Abstract — Poverty, unemployment, reduced farm sizes due to population growth and climate change has led to numerous households joining the labor and time consuming occupation that requires low skills and consequently low earnings as well as a copy strategy. Manual stone quarrying mainly involves digging and aggregate manufacturing which exposes the miners to hazardous risks. Limited interest has been accorded to determine how manual stone quarry workers respond to occupation health and safety hazards through the use of personal protective equipment's including helmets boots, gloves, safety glasses and nose/face masks despite a growing literature on occupation and health issues related to manual stone quarrying. The study set out to determine whether the education, awareness raising and sensitization interventions improved health and safety practices amongst the women ASM through the usage of relevant types of personal protective equipment. It is an assessment of the influence of knowledge and awareness of occupational safety and health amongst the women

A cross-sectional study provided data from ASM women quarry miners between August to September 2024. The population of this study was women ASM working in the numerous manual quarry sites. The four aggregates processing sites had an average daily population of one hundred and twenty (120) women manual stone quarry workers. From Morgan's table, a population of 120 produces a sample size of 92. Only 90 of the selected 92 consented to participating in the survey research. Nearly two thirds of respondents have spent between one to ten years at the manual quarry sites earning living. 61.1% have had between one and ten accidents over the past twelve months. 80% of the causes of injuries are those struck by rock pieces, mainly flying ones during breaking down (31.1%), followed by sharp rock edges mainly during handling (25.6%) and falls constituting 23.3%. 72.6% of the injured parts included hand (44.4%) and the legs at 32.2%. In manual stone quarrying, the hands and legs are parts mostly used in the processing of the aggregates.

62.2% had opportunities to health and safety informal training received it through an NGO. Overall 67.8% of the women were aware of the importance of personal protective equipment's. Although 47.8%(43) use personal protection equipment less than half at 22.2%(20) use the items often while a significant 25.6%(23) sometimes use the items. However, 47 respondents (52.2%) never use personal protection equipment. The regression analysis of the studies indicates that the only significant factor for both frequencies of use and type of PPE is knowledge and awareness on the importance of PPE. A significant influence on how often use personal protective equipment due to awareness of the importance of personal protective equipment and significant influence on type of personal protective equipment used due to awareness of the importance of personal protective equipment.

Keywords— PPE, Manual Stone Quarry, Artisanal Small Scale Miners, Type of PPE

1. Introduction

The manual stone quarry workers are part of an estimated over 80 million people who depend on artisanal mining for livelihood and close to 20 million who work directly in the sector [1]. The sectors significant contributions towards millions of household's incomes overshadows the sector association with poor working conditions with negative effects on health, safety and environment [2].

The manual stone quarry miners predominantly use hand tools including hoes and jack hammers and fire to soften the hard rocks before it is reduced to manageable boulders. The

degradation process may involve crushing the boulder with another slightly maneuverable boulder [3],[4].

Personal protective equipment's are very effective in preventing foreign body, chemical, hot particle, and radiation exposure or impact to various body parts and reducing the severity of exposure or impact when exposure or impact occurs when used and well fitted [5]. The perilous occupation has fairly surmountable barriers to entry for the sake of earning a living by the impoverished households especially the female led households of peri-urban Lira City and also due to increasing demand for low cost construction materials.

The study set out to determine whether the education, awareness raising and sensitization interventions improved health and safety practices amongst the women ASM through the usage of relevant types of personal protective equipment. It is an assessment of the influence of knowledge and awareness of occupational safety and health amongst the women ASM working in the small scale stone quarrying sector in Northern Uganda through an evaluation of the impact of information on the use of personal protective equipment and the type of personal protective equipment used by women manual stone quarry workers.

1.1 Problem Statement

At Ngetta dolomite rocky hills, 8 kilometers from Lira City Centre, hundreds of men, women and children eke out daily living in an occupation handed down from generations before them. Men of specialized manual boulder extraction skills and experience hung perilously on strategic surfaces several tens of meters high up to extract rock boulders of several hundred kilograms. The boulders which apparently are still static are further degraded into manageable pieces to supply the women, children and other men who wait anxiously to process them into aggregates of varying sizes. The task by mostly women is performed in a sweltering open air environment with different types of improvised crushing equipment to turn them into marketable aggregate sizes.

Stone quarrying is one of the many quarrying activities that provides the much needed construction materials [6]. The sectors continued utilization of obsolete techniques and technology coupled with very limited deployment of resources to facilitate investment is resultant to the notoriously poor and risky working conditions of the artisanal miners [7]. Inadequate observation of health and safety practices amongst the artisanal miners often results to frequent accidents leading to death or disability or distorted quality of life [8].

Limited interest has been accorded to determine how manual stone quarry workers respond to occupation health and safety hazards through the use of personal protective equipment's despite growing studies on occupation and health issues related to manual stone quarrying. There is also few if at all available, published research covering usage of and type of PPE in the manual stone quarrying sector in this area in Uganda especially in relation to women manual stone quarry workers, though studies have been conducted in the areas of mechanized stone quarrying, therefore the research will set up a background for future studies related to the above.

1.2 Main Objective

To Explore the usage of and type of Personal Protective Equipment amongst women artisanal small scale miners(ASM) in Northern Uganda.

1.3 Specific Objective(SO)

SO 1: To evaluate the impact of sources of information about the importance of the use of personal protective equipment on the use of personal protective equipment by the women ASM

SO 2: To evaluate the impact of sources of information about the importance of the use of personal protective equipment on the type of personal protective equipment used by the women ASM.

1.4 Research Questions

Research Question 1:

Is there a statistically significant relationship between sources of information about the importance of the use of personal protective equipment and the use of personal protective equipment amongst the women ASM?

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Is there a statistically significant relationship between sources of information about the importance of the use of personal protective equipment and the type of personal protective equipment amongst the women ASM?

2. Related Work

With the strength of the arm as a pivotal tool, small scale stone quarry miners utilize the most rudimentary equipment's in the extraction industry consequential to numerous occupational health and safety hazards.

Health hazards results into the development of illness or diseases and safety hazards that cause accidents at workplaces resulting to injuries [9]. Unsafe mining practices also poses serious dangers to human health and the environment [10]. Previous work highlighted that although the miners were very aware of the significance of personal protective equipment, most them detest using them with reasons ranging from uncomfortable to reducing work rates. Findings also revealed that only 30% of the small scale miners make use of personal protective equipment during operations, while atleast 80% are skeptical about the use of recommended personal protective equipment [11].

Another related study also contends that health education enhances awareness level and use of personal protective equipment [12]. In a similar study, the findings revealed that some miners opt not to utilize personal protective equipment's because they say is uncomfortable and also see no value in the personal protective equipment's [13].

3. Theory/Calculation

A not-for-profit organization conducted an awareness raising and education intervention activities in partnership with World Bank to provide in a fortnight long activity for 100 small scale manual stone quarrying women. During the awareness raising and education interventions, the facilitators helped the participants to develop self-efficacy and offering opportunities to practice facilitating the measures with their peers. After the awareness raising, ongoing meetings for mentors and participants was conducted as a follow-up. Therefore, this study adopted the theory of planned behavior(TPB) that postulates that behaviors are influenced by intentions, which are determined by three factors:

attitudes, subjective norms, and perceived behavioral control [14].

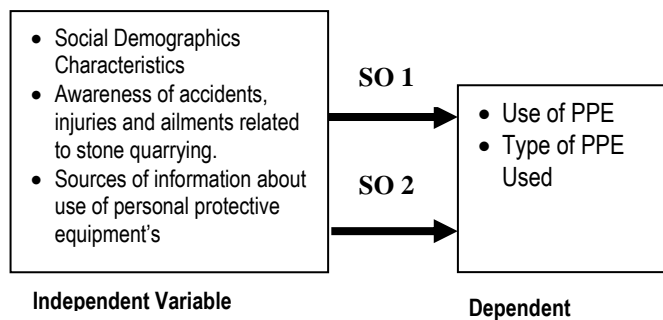


Figure 1: Conceptual Framework

Independent variables (Socio demographic characteristics, awareness of accidents, injuries and ailments related to stone quarrying and sources of information about the importance of the use of personal protective equipment’s).

Dependent variables (Use of personal protective equipment and type of personal protective equipment’s).
Based on the above conceptual framework, the research questions for the study are based on the respective objectives below.

Objective 1:

To evaluate the impact of sources of information about the importance of the use of personal protective equipment on the use of personal protective equipment amongst women ASM.

Research Question 1:

Is there a statistically significant relationship between sources of information about the importance of the use of personal protective equipment and the use of personal protective equipment amongst women ASM?

Objective 2:

To determine the impact of sources of information about the importance of the use of personal protective equipment on the type of personal protective equipment used amongst the women ASM.

Research Question 2:

Is there a statistically significant relationship between sources of information about the importance of the use of personal protective equipment on the type of personal protective equipment amongst the women ASM.?

4. Experimental Method/Procedure/Design

Study design

A cross-sectional study provided data from ASM women quarry miners between August to September 2024. The selected study design leverages the use of an interview survey and is very crucial for establishing preliminary evidence in planning a future advanced study.

Study Setting

The site of the study is at the foots of the magnificent Ngetta dolomite rocky hills with its peak 4,500ft above sea level. It is home to atleast 100 velvet monkeys, various bird species, butterflies as well as snakes. It is located just over 8

Kilometres from Lira City centre along Lira Kitgum Road. Lira City has more than ten granite rocks which supplies nearly 90% of aggregates construction needs of the City and the surrounding town councils and districts.

Study Population

The population of this study was women ASM working in the numerous manual quarry sites. The women usually accompanied by their children and at times spouses are part of generations who have devoted their lives to the labour intensive occupation of crushing the massive dolomite rocks in Ngetta located in the outskirts of Lira City.

Inclusion criteria

All women ASM working in the previously selected aggregate processing sites over the past two years for interventions in enhancing awareness and knowledge about stone quarry mining health and safety precautions by occupational health safety education services private service provider. The four aggregate processing sites, selected by the NGO who facilitated interventions to enhance knowledge and awareness on health and safety in stone quarrying sites yielded a total of about one hundred and forty-two (142) women manual stone quarry workers currently at the sites.

Exclusion criteria

Women ASM who joined the quarry sites after 2022 were not were excluded from the study including females under the age of 18.

Sampling method and Size

Women ASM were drawn through random probability sampling. Through probability each member of the population gains access to the study sample group through being chosen by chance. The study adopted the Krejcie & Morgan table for determining sample size. The four aggregates processing sites had an average daily population of one hundred and twenty (120) women manual stone quarry workers. From Morgan’s table, a population of 120 produces a sample size of 92. Only 90 of the selected 92 consented to participating in the survey research

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3200	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note: — N is population size. S is sample size. Source: Krejcie & Morgan, 1970

Figure 2: Morgan’s Table

Sources of and Collection of Data:

The mainly qualitative data was sourced directly from the Women ASM with regards to the purpose of the study and recollections from years of deriving livelihood from quarry sites. The primary source of data was collected from the respondents using the questionnaire. The questionnaires were validated by experts in the field of ASM occupation health and safety. Secondary sources of information included reports from active NGO and CBO’s in the quarry site, articles and publications.

Processing and Analysis

Data were collected, screened, sorted, and thereafter analysed using SPSS version 22. The instrument used for descriptive data analysis was tables with numbers and percentages. Multilinear analysis of variables association used for testing statistical significance. A p value less than 0.05 was considered statistically significant.

5. Results and Discussion

5.1. Descriptive Statistics

5.1.1. Socio-Economic Demographics

Table 1: Age of the Respondent

	Frequency	Percent	Cumulative Percent
18-35	25	27.8%	27.8%
36-50	43	47.8%	75.6%
Over 50	22	24.4%	100.0%
Total	90	100.0%	

Nearly one third (27.8%) of the respondent women are of youth age (18-25) indicating the level of unemployment and underemployment of youths in the area. With nearly half (47.8%) of the women aged between 36-50, it is safe to estimate that most of the youths continue with the manual stone quarrying occupation into their post youth age. Almost one quarter (24.4%) are women aged over 50 which is indicative of the drop-out in the occupation reflective of the demands of the occupation especially swiftness, endurance and strength that drops gradually with the advancement in age. It is also important to note that the drop-out can also be attributed to change of occupation through adopting alternative livelihoods means since the onset of COVID 19 in the region since the trade was no longer viable in the face of stringently enforced lock-downs.

Table 2: Level of Education

	Frequency	Percent	Cumulative Percent
No Formal Education	15	16.7%	16.7%
Primary	51	56.7%	73.3%
Secondary	21	23.3%	96.7%
Tertiary	3	3.3%	100.0%
Total	90	100.0%	

16.7% had no formal education and over half (56.7%) had attained basic education (primary education). An encouraging 23.3% had also attained secondary education, mainly those

who never or completed O’ Level. The statistics is reflective of the compulsory free primary education policy and subsequently secondary education. The small but significant 3.3% who had attained tertiary once again reflects the increasingly limited gainful employment opportunities especially amongst the youths who fall back to enterprises with limited barriers to entry.

Table 3: Marital Status

	Frequency	Percent	Cumulative Percent
Single	20	22.2%	22.2%
Married	28	31.1%	53.3%
Separated	30	33.3%	86.7%
Widowed	6	6.7%	93.3%
Cohabiting	6	6.7%	100.0%
Total	90	100.0%	

Majority of the respondents were separated (33.3%) and equally 31.1% are still married. The level of separation is indicative of the prevailing testimonies from the women ASM that domestic violence is common in artisanal small scale miner’s households. Cohabiting is always consummated at the quarry site itself another indication of incidences of consensual promiscuous sex in the quarry site. Widows account for 6.7% also comparatively high.

Table 4: Years Spent Working in the Quarry Site

	Frequency	Percent	Cumulative Percent
1-10	57	63.3%	63.3%
11-20	28	31.1%	94.4%
21-30	5	5.6%	100.0%
Total	90	100.0%	

Nearly two thirds of respondents have spent between one to ten years at the manual quarry sites earning living. About one third (31.1%) have spent more than a decade and some have spent exactly two decades at the site. 5.6% have spent more than two decades most of whom are widowed and above 50 years old.

5.1.2. Awareness of Accidents, Injuries and Ailments related to stone quarrying

Table 5: Number of Accidents in the Past 12 Months

	Frequency	Percent	Cumulative Percent
1-5	24	26.7%	26.7%
6-10	31	34.4%	61.1%
More than 10	35	38.9%	100.0%
Total	90	100.0%	

A great number of respondents have had more than ten accidents in the past one year at 38.9%. 61.1% have had between one and ten accidents over the past twelve months.

Table 6: Severity of the Injury

	Frequency	Percent	Cumulative Percent
Minor	41	45.6%	45.6%
Major	26	28.9%	74.4%
Severe	23	25.6%	100.0%
Total	90	100.0%	

According to the respondents, nearly one half (45.6%) in the above table categorized their injuries as minor. The description could be misleading in that, to most of the respondents once an injury does not warrant attending a health facility, they categorize as minor. 25.6% of the respondents agreed that their injuries were severe while 28.9% agreed that they were major injuries.

Table 7: Common Injuries that Afflict ASM

	Frequency	Percent	Cumulative Percent
Cuts	32	35.6%	35.6%
Fractures	12	13.3%	48.9%
Bruises	37	41.1%	90.0%
Back/Chest Injuries	9	10.0%	100.0%
Total	90	100.0%	

Back and Chest injuries recorded 10%, this is particularly interesting in that it reflects the key activities that cause back pain mainly haulage and breaking boulders that are predominantly carried out by men. The few chest injuries were attributed to long duration of undesirable sitting postures while processing aggregates from boulders broken down into tens of pieces be predominantly men. The high percentage of bruises registered at 41.1% is reflective of the earlier response in categorizing injuries i.e. minor, major and severe, some major injuries are wrongly mistaken as minor by the respondents. Fractures account for 13.3% and cuts 35.6%. The high rate of cuts is attributed to sharp edges of the rocks, hand tools and falls, however fracture respondents mostly attributed the incidences to awkward falls and skidding.

Table 8: Causes of Most of the Injuries

	Frequency	Percent	Cumulative Percent
Struck by Rocks	28	31.1%	31.1%
Sharp Rock Ages	23	25.6%	56.7%
Fall	21	23.3%	80.0%
Working with Tools	13	14.4%	94.4%
Breaking Rocks	5	5.6%	100.0%
Total	90	100.0%	

80% of the causes of injuries are those struck by rock pieces, mainly flying ones during breaking down (31.1%), followed by sharp rock edges mainly during handling (25.6%) and falls constituting 23.3%. Breaking rocks recorded 5.6%. The above finding reveals that manual stone quarrying is laden with flying rock pieces due to the processes involved in the processing of aggregates.

Table 9: Body Part Most Affected by Injuries

	Frequency	Percent	Cumulative Percent
Head	12	13.3%	13.3%
Hand	40	44.4%	57.8%
Back/Chest	9	10.0%	67.8%
Legs/Knees/Feet	29	32.2%	100.0%
Total	90	100.0%	

72.6% of the injured parts included hand (44.4%) and the legs at 32.2%. In manual stone quarrying, the hands and legs are parts mostly used in the processing of the aggregates. The

head with 13.3% and back or chest injury can be sustained during haulage or struck by a flying rock pieces. Findings from other studies concur with this findings, where the most common type of injury experienced was hand injury (80%) followed by leg injury (30%) [15].

Table 10: Most Common Type of Ailment

	Frequency	Percent	Cumulative Percent
Cough	11	12.2%	12.2%
Aches/Pain	14	15.6%	27.8%
Chest	22	24.4%	52.2%
Skin Infections	17	18.9%	71.1%
Lung Disease	6	6.7%	77.8%
Red Eyes	19	21.1%	98.9%
Tetanus	1	1.1%	100.0%
Total	90	100.0%	

Chest pain (24.4%), Red eyes (21.1%), skin infections (18.9%) and pain (15.6%) are the most common type of ailments amongst the respondents. The lung diseases (6.7%) could be as a result of inhalation of silica during measuring were dust and fumes are emitted after transfer from measuring can into stationary truck.

5.1.3. Sources of information about Use of Personal Protective Equipment(PPE)

Table 11: Access to Formal Safety Training

	Frequency	Percent	Cumulative Percent
Yes	56	62.2%	62.2%
No	34	37.8%	100.0%
Total	90	100.0%	

There was enhanced access to informal formal health and safety training to 62.2% of the respondents while a significant number (37.8%) never had access to the informal training. It has to be realised that all of those who never had access to health and safety training also missed out on the training opportunity provided by the NGO.

Table 12: Access to Information About Health and Safety Hazard

	Frequency	Percent	Cumulative Percent
Friends	13	14.4%	14.4%
Colleagues	12	13.3%	27.8%
Workplace	6	6.7%	34.4%
Awareness Raising and Education Workshops	56	62.2%	96.7%
Radio, TV and Newspaper	3	3.3%	100.0%
Total	90	100.0%	

56 respondents (62.2%) with enhanced opportunity to health and safety informal training received it through an NGO as earlier on mentioned. 34 respondents who never had access to training had the opportunity to learn from friends (13 respondents), Colleagues (12 Respondents), Workplace (6 Respondents) and Radio/TV/Newspaper (3 Respondents).

Overall 67.8% of the women were aware of the importance of personal protective equipment's. The analysis reveals that workplace information was instrumental in providing additional 5 women respondents to respond positively when asked about their awareness of PPE. It was also realized that friends, colleagues provided inadequate information due to basically their lack of trainer and trainers capacity compared to workplace which is hands on. The few recorded for radio, TV, and newspaper indicates the scarcity of the medium amongst the artisanal small scale miners with very few able to access either print or online newspapers.

Table 13: Aware of the Importance of PPE

	Frequency	Percent	Cumulative Percent
Yes	61	67.8%	67.8%
No	29	32.2%	100.0%
Total	90	100.0%	

61% of the respondents are aware of the importance of personal protective equipment. The findings concur with a previous study that indicated that 64.9% of quarry workers were aware of the need for them to use safety devices [16].

5.1.4. Use of Personal Protective Equipment(PPE)

Table 14: How Often ASM Use PPE

	Frequency	Percent	Cumulative Percent
Always	20	22.2%	22.2%
Sometimes	23	25.6%	47.8%
Never	47	52.2%	100.0%
Total	90	100.0%	

Although 47.8%(43) use personal protection equipment less than half at 22.2%(20) use the items often while a significant 25.6%(23) sometimes use the items. However, 47 respondents (52.2%) never use personal protection equipment.

Table 15: Type of PPE Used

	Frequency	Percent	Cumulative Percent
Masks	15	16.7%	16.7%
Helmets	3	3.3%	20.0%
Boots	5	5.6%	25.6%
Gloves	2	2.2%	27.8%
Body Overall	18	20.0%	47.8%
Don't Use Any	47	52.2%	100.0%
Total	90	100.0%	

Body overall is the most prevalent personal protective equipment available with 18 respondents in possession of the item (20%) followed by face masks with 15 respondents (16.7%). Apart from 52.2% who don't use any type of personal protective equipment, a concerning 3.3%, 5.6% and 2.2% use helmets, boots and gloves respectively.

Table 16: How ASM Accesses PPE

	Frequency	Percent	Cumulative Percent
Borrow	7	7.8%	7.8%
Purchase	26	28.9%	36.7%
Donation	10	11.1%	47.8%
No Opportunity	47	52.2%	100.0%
Total	90	100.0%	

With 7.8% of the respondents borrowing the items, an encouraging 28.9% acquired the items through outright purchase and 11.1% benefitted from donations from private sector and individuals.

5.1.5. Non-Use of Personal Protective Equipment(PPE)

Table 17: Reasons for Non-Utilization of PPE

	Frequency	Percent	Cumulative Percent
Not Necessary	4	4.4%	4.4%
Not Convenient	2	2.2%	6.7%
Uncomfortable to Use	8	8.9%	15.6%
Expensive	46	51.1%	66.7%
No Education about Usage	30	33.3%	100.0%
Total	90	100.0%	

51.1%(46) of the respondents attributed the non-usage of personal protection equipment to being expensive and an equally substantial number of 30 respondents (33.3%) attributed the non-usage to lack of education about the use of personal protection equipment's.

5.2. Correlations Analysis

The multiple linear regression was used to estimate the relationship. The formula for a multiple linear regression is:

$$Y = B_0 + B_1X_1 + \dots + B_nX_n + \epsilon$$

- Y= the predicted value of the dependent variable
- B₀= the y-intercept (value of y when all other parameters are set to 0)
- B₁X₁= the regression coefficient= (B₁) of the first independent variable (X₁) (a.k.a. the effect that increasing the value of the independent variable has on the predicted y value) = do the same for however many independent variables you are testing
- B_nX_n= the regression coefficient of the last independent variable
- ε = model error (a.k.a. how much variation there is in our estimate of Y)

Hypothesis 1:

There is a positive relationship between sources of information about the importance of the use of personal protective equipment and the use of personal protective equipment.

Null Hypothesis 1A:

Sources of information about the importance of the use of personal protection equipment influences how often personal protection equipment is used.

Alternative Hypothesis 1 B:

Sources of information about the importance of the use of personal protection equipment does not affect how often personal protection equipment is used by the artisanal small scale miner

Table 18: Model Summary (How Often ASM Use PPE)

R	R Square	Adjusted R Square	R	Std. Error of the Estimate
0.26	0.07	0.05		0.79

In the table above, it is required that the difference between R-square and Adjusted R-square minimum. Therefore, the above model summary table is satisfactory to proceed with the next step.

Table 19: ANOVA (How Often ASM Use PPE)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	3.97	2	1.98	3.14	0.048
Residual	54.93	87	.63		
Total	58.90	89			

5% ($p < 0.05$) level of the significance level has been chosen for this study. The p-value of 0.048 is less than 0.05 in the above table, i.e. below the tolerable significance level (0.05). Therefore, the result is significant. A value greater than 1 ($F = 3.14$) for F-ratio yields efficient model.

Table 20 a: Coefficients (How Often ASM Use PPE)

	B	Std. Error	Beta	t	Sig.
(Constant)	1.14	0.75	0.00	1.53	0.129
Access to Information About Health Hazard and Safety	0.10	0.12	0.15	0.86	0.394
Aware of the Importance of	0.63	0.30	0.36	2.10	0.039

If Sig. is < 0.05 , the null hypothesis is rejected, i.e. implies there is an impact. If Sig. is > 0.05 , then the null hypothesis is not rejected i.e. there is no impact.

Table 20b: Interpretation

Independent Variable	Sig.	Hypothesis Testing Result at 95% confidence interval	Interpretation
Aware of the Importance of personal protective equipment	0.039	Null Hypothesis Rejected (0.039 < 0.05)	A significant influence on how often use personal protective equipment due to awareness of the importance of using personal protective equipment

Hypothesis 2:

There is a positive relationship between sources of information about the importance of the use of personal protective equipment and the type of personal protective equipment.

Null Hypothesis 2A:

Sources of information about the importance of the use of personal protection equipment determines the type of personal protection equipment used.

Alternative Hypothesis 2B:

Sources of information about the importance of the use of personal protection equipment does not determine the type of personal protection equipment used.

Table 21: Model Summary (Type of PPE Used)

R	R Square	Adjusted R Square	R	Std. Error of the Estimate
0.51	0.26	0.24		1.66

The value is R (0.26), which is not far off from Adjusted R Square (0.24). Therefore, the above model summary table is satisfactory to proceed with the next step.

Table 22: ANOVA (Type of PPE Used)

	Sum of Squares	df	Mean Square	F	Sig.
Regression	82.95	2	41.47	15.02	0.000
Residual	240.21	87	2.76		
Total	323.16	89			

5% ($p < 0.05$) level of the significance level has been chosen for this study. The p-value of 0.000 is less than 0.05 in the above table, i.e. below the tolerable significance level (0.05). Therefore, the result is significant. A value greater than 1 ($F = 15.02$) for F-ratio yields efficient model for further analysis.

Table 23a: Coefficients (Type of PPE Used)

	B	Std. Error	Beta	t	Sig.
(Constant)	0.78	1.56	0.00	0.50	0.620
Access to Information About Health Hazard and Safety	0.20	0.25	0.12	0.79	0.432
Aware of the Importance of	2.43	0.62	0.60	3.89	0.000

Table 23b: Interpretation

Independent Variable	Sig.	Hypothesis Testing Result at 95% confidence interval	Interpretation
Aware of the Importance of personal protective equipment	0.000	Null Hypothesis Rejected (0.000 < 0.05)	A significant influence on type of personal protective equipment used due to awareness of the importance of personal protective equipment

The findings above indicate that there is a significant influence on type of personal protective equipment used due to awareness of the importance of personal protective equipment. Awareness is generated by knowledge. Knowledge is amongst the factors related to risky work undertakings consequential to accidents and increased workplace safety [17],[18].

6. Conclusion and Future Scope

Artisanal small mining sector that includes the manual stone quarrying is notable for high prevalence of accident and injuries due to failure to use personal protective equipment or using the incorrectly as indicated in the finding above whereby 61.1% have had atleast an accident in the last twelve months. 77.8% of the respondents sometimes and never use personal protective equipment with a whopping 52.2% of them reported never using PPE at all. On the other hand, it is also prudent to mention that 47.8% of the studied reported to have used PPE either always or sometimes.

Previous studies conducted in Africa as well reveal that prevalence of accidents amongst workers was 73.2% in Egypt [19]. The study also investigated reasons for non-use of PPE and the findings was that 51.1% agreed that the items are expensive while 33.3% attributed the low usage of the PPE to no awareness raising and educational opportunities aimed at enhancing knowledge about health and safety and control mechanisms.

A point of concern in the findings was the surprisingly significant percentage reporting that PPE are not comfortable while using. This is no surprise, in that most of the PPE equipment have been modelled with the male dominating the mind of the model developer. The above findings in general captures pertinent issues like comfortability, ignorance lack of access amongst others in line with previous studies [20].

16.7% of those who used PPE utilize Nose/Face masks for respiratory protection, and 20% use body overalls for skin protection. Helmets, Boots and Gloves registered only 3.3%, 5.6% and 2.2% respectively mainly acquired through donation which accounted for 11.1% of how the respondents access the PPE. The few had stints with companies that employ mechanical quarrying technologies. Nose/face masks and overall are relatively affordable and that explains the numerous respondent able to access. Similar findings were also recorded in previous studies [21], [22].

The regression analysis of the studies indicates that the only significant factor for both frequencies of use and type of PPE is knowledge and awareness on the importance of PPE. A significant influence on how often use personal protective equipment due to awareness of the importance of personal protective equipment ($p=0.039 < 0.05$) and significant influence on type of personal protective equipment used due to awareness of the importance of personal protective equipment ($p= 0.000 < 0.05$). However, in relation to knowledge and awareness, the findings are in agreement with recent studies [23], [24].

Manual stone quarrying is prone to the processor being struck by flying rocks during aggregate processing (31.1%), some of the flying rock pieces have sharp edges that causes major injuries recorded at 25.6%. Falls are common during haulage and walking over unstable rocks that are stationary and used for access to other hidden caves or processing point. Falls

recorded 23.3%. Similar findings have been recorded in studies conducted in other places [25].

34 respondents out of the 90 recorded that they never had opportunity for health and safety training and also lack of health and safety training also significant factor in the non-use of PPE. Further investigation also revealed that the majority of the non-users are respondents who had no opportunity to access health and safety training therefore most prone to injuries and accidents in agreement with related work [26].

Several studies recommend the enforcement of rules in popularizing the use of personal protective equipment. Respondents at the quarry sites suggested that there is need for establishing a dressing code at the stone quarrying sites for the miners to adhere to. A study on attitudes towards wearing personal protective equipment's reveals a lackluster behavior due to lack of motivations or enforcement of rules to ensure workers in expose situations like waste scavenger and also stone quarry workers wear the protective equipment's work [27]. Another study concluded that areas surrounding mining areas are severely polluted therefore there is need to put in place rules to protect communities within the sites, in particular from heavy metal pollutants [28].

Data Availability

The researcher utilized minimal qualitative data because of a lack of finances, time, and manpower. So, the author recommends further investigation into the influence and impacts of the above factors.

Conflict of Interest

The author does not have any conflict of interest.

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AUTHORS PROFILE

Okello Olwo Kenneth has 25 (Twenty-Five) years of progressive practical and specialized experience in managing community development Program. I am an innovative with a proven ability to identify and capitalize on project opportunities and I have wider experience in enterprise development. Studied Information Technology at Cavendish University in Uganda. Research Experience includes: World Bank DELVE research assistant and Amolatar District Local Government Agricultural Department individual crop value chain analysis research and data analysis assistant.



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