BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

Knowledge and perceptions of occupational exposure to dust among informal sector stone crushers under resource-constrained settings: case of Chitungwiza, Zimbabwe

By

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RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT TO THE REQUIREMENTS OF THE BACHELOR OF SCIENCE HONOURS DEGREE IN SAFETY, HEALTH AND ENVIRONMENTAL MANAGEMENT (BSc. SHEM)

DECLARATION

To be complied by the student

Registration number B201649B

I, Anesu Victory Tapera do hereby declare that this work is entirely the product of my own research and it was never used on any other academic work. All reference to previously published work has been clearly shown.

Student signature  Date…28 June 2024

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This dissertation is suitable for submission to the faculty and have been checked for conformity with the faculty guidelines.

Supervisor's signature: Date: ……

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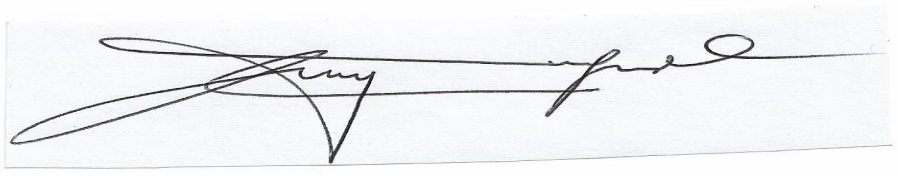

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Supervisor Acceptance Letter

The Chairman

Department of Environmental Science

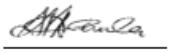
Date: 19 September, 2023

I wish to inform you that I am accepting *Anesu Tapera (B201649B)* as my student to guide his research work leading to attainment of a BSc. (Hons) SHEM degree with Bindura University Science and Education. I will supervise him throughout the research process.

Proposed title:

Knowledge and perceptions on occupational exposure to dust among informal sector stone crushers under resource-constrained settings: case of Chitungwiza, Zimbabwe

Sincerely,



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Project Title: Knowledge and perceptions of occupational exposure to dust among informal sector stone crushers under resource-constrained settings: case of Chitungwiza, Zimbabwe

Programme: Bachelor of Science Honors Degree in Safety, Health and Environmental Management

Year: 2024

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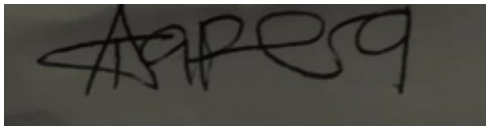
Signed:  Date…28 June 2024

DEDICATION

This research is a tribute to the Tapera family, whose warmth, support, and love have been a constant source of inspiration.

ACKKNOWLEDGEMENTS

I would like to acknowledge the guidance of the good Almighty God in my life. To my parents, I would like to say thank you so much for giving me the opportunity to study Safety health and environmental management and providing me with care, support and encouragement. I am heavily indebted to my Supervisor, Dr. Artwell Kanda for his guidance and patience which had given me direction and encouragement even when things were getting hard.

ABSTRACT

Background: Occupational dust exposure is a significant health hazard for the informal sector who are often unaware of the associated potential health risks due to lack access to protective equipment.

Objectives: Knowledge and perceptions to occupational exposure to dust mong informal stone crushers were determined. The association of their demographic factors and knowledge and perceptions were analysed.

Methods and materials: A closed-ended and pre-tested questionnaire developed from literature was self-administered to 47 participants in a cross-sectional survey to collect data on demography, knowledge and perceptions on occupational exposure to dust.

Key findings: Results indicate that about ¾ of the participants were male (72.3%). Almost half of the participants had primary level education (48.9%). The majority of the participants had no prior training on occupational exposure to dust (87.2%). Overall, participants had moderate knowledge (44.71%) and negative perceptions (39.28%) on occupational exposure to dust. Results indicate that there was a significant association between the knowledge level and the level of education ($\chi^2 = 14.098$, $p = 0.029$) and a significant association between the perceptions and work experience ($\chi^2 = 18.947$, $p = 0.004$).

Conclusion: Participants had moderate knowledge and negative perceptions on occupational exposure to dust.

Key terms: Informal sector; Occupational Health and Safety; Occupational dust; Resource-constrained.

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LIST OF ACRONYMS

ILO: International Labor Organization

NIOSH: National Institute for Occupational Safety and Health

KP: Knowledge and Perception

PPE: Personal Protective Equipment

ZimStat: Zimbabwe National Statistics

APA: American Psychological Association

SPSS: Statistical Package for the Social Sciences

CDC: Centers for Disease Control and Prevention

CHAPTER 1: INTRODUCTION

1. INTRODUCTION

1.1 BACKGROUND OF THE STUDY

About four million people die each year globally from occupational respiratory diseases (IHME, 2023) such as silicosis, asbestosis and pneumoconiosis (Sakthimeena, et al., 2023). The formal sector is guided by occupational safety standards and follow work procedures which are strictly enforced and adhered to. This results in reduced employee exposure and accidents (Duarte et al., 2022). That does not always happen in the informal sector. The informal sector employs 58% of the global population due to high unemployment rates (ILOSTAT, 2023), particularly in low- and middle-income countries (Feng et al., 2024).

The informal sector plays a significant role in national economies of developing countries by providing opportunities for a large portion of the population (Sadek, 2024). Informal stone crushing workers manually extract, crush and process stones for construction purposes (Adam, 2019). However, this occupation potentially exposes workers to various health hazards in particular dust-related respiratory illnesses (Islam et al., 2022). Respiratory illnesses associated with stone crushing include shortness of breath, chest tightness, silicosis and asbestosis (Samana et al., 2019; Ahmed et al., 2022; Mishra et al., 2023). An informal stone crusher is a self-employed worker who is involved in the informal occupational activity of stone crushing (Nelson et al., 2020).

Informal stone crushers are at high risk of contracting respiratory diseases because there are hardly any occupational safety issues enforced. Further, this sector involves women and children as well (Muya et al., 2019), and the poor (ILO, 2018). Overall, it shows that workers are highly exposed to dust as a result of limited protective clothing (David et al., 2020). It appears literature indicates that there is limited research on the knowledge and perception of informal stone crushers to occupational dust exposure as the sector is rarely monitored. The current work assessed the knowledge and perceptions of this group to dust exposure in small towns of developing countries using Chitungwiza, Zimbabwe.

1.2 PROBLEM STATEMENT

The informal construction industry appears to rely heavily on locally crushed stone considered cheap and readily available. However, informal stone crushers who include men, women and children, work in unsafe conditions exposing them to hazards which affect the respiratory system. Studies were done on occupational exposure to dust from crushed stone mainly on characterising dust (e.g., Kanyembe et al., 2020) and assessing worker exposure (e.g., Shams et al., 2023) in the formal sector. Limited work appears to have been done to understand the level of awareness and perceptions among informal stone crushers regarding the occupational risks associated with dust exposure. This understanding may be important in the development of targeted interventions to improve on their occupational safety and work practices.

1.3.1 AIM

- To assess the levels of knowledge and perceptions on occupational exposure to dust among informal stone crushers under resource-constrained settings.

OBJECTIVES

- To determine knowledge and perceptions of informal stone crushers on occupational exposure to dust.
- To establish whether there is an association between the characteristics of participants and their knowledge and perceptions on occupational exposure to dust.

1.4 SIGNIFICANCE OF THE STUDY

This study provides an assessment of the levels of knowledge and perceptions on occupational exposure to dust among informal stone crushers under resource-constrained settings. This understanding is important to create an awareness to, and prevent the development of respiratory diseases by adopting safety measures. Further, findings may help relevant regulatory authorities and non-governmental organisations to make informed decisions in developing targeted interventions. They will add to the debate on occupational exposure to dust from stone crushing in the informal sector including vulnerable populations, their knowledge and perceptions, which influence their behaviour. The work may also be used as a baseline study in future related studies.

1.5 RESEARCH QUESTIONS

- What are the levels of knowledge and perceptions among informal sector stone crushers on occupational exposure to dust?

- Is there any relationship between demographic characteristics of the stone crushers with their knowledge and perceptions on occupational exposure to dust?

1.6 ASSUMPTIONS

- Informal stone crushers in resource-constrained settings are exposed to occupational dust during their work activities.
- Knowledge and perceptions of occupational exposure to dust among informal stone crushers are associated to their demographic characteristics.
- Informal stone crushers have limited exposure to occupational health and safety information
- Research instruments used will collect the required information

1**.7 LIMITATIONS**

- Self-reported information may be subjective and influenced by social desirability bias.
- The research relies on the participants' ability to accurately recall and articulate their knowledge and perception, which may be affected by factors such as memory bias or language barriers.
- Findings are from a localized setting. They may not be over-generalized to other areas.

1.8 DELIMITATIONS

- The study focuses specifically on informal stone crushers and does not include formal sector workers or other occupations that may also involve dust exposure.
- The research is centered on the knowledge and perceptions of risk of exposure among stone crushers and does not assess actual levels of exposure or related health outcomes.
- The study does not directly investigate the effectiveness or implementation of specific interventions or policies to mitigate dust exposure among informal sector stone crushers.

CHAPTER 2: LITERATURE REVIEW

2. LITERATURE REVIEW

2.1 INTODUCTION

This chapter presents a review of the existing literature on the knowledge and perceptions of occupational exposure to dust among informal sector stone crushers under resource-constrained settings. The review is divided into three main sections: sources and characteristics of dust in stone crushing activities, health effects of occupational dust exposure and knowledge and perceptions of dust exposure among informal stone crushers.

2.2 INFORMAL STONE CRUSHING

Stone crushing involves the use of crushers to break down stones into smaller sizes, often resulting in the generation of dust (Nelson et al., 2020), potentially exposing workers to various health risks associated with dust inhalation (Leigh et al., 2019). This work is usually carried done by a group of workers or individuals usually under low-income settings (ILO, 2018). This is as a result of high unemployment levels and poverty (Chileshe and Moonga, 2023). The work is done any time of the year in response to seasonal demand for construction materials, weather conditions, market prizes and availability of stone resources (Hillet et al., 2019).

2.3 STONE CRUSHING: A DUSTY WORK STATION

Stone crushing is a dusty work activity (Shams et al. 2024). In formal stone crushing, the main sources of dust are the feeding hopper, primary and secondary crushers, conveyors, and screening operation (Madhuri and Nagaraj, 2019). Informal sector stone crushers engage in tasks that include extracting, crushing and transporting stones for construction purposes. These activities generate significant amounts of dust, primarily from the mechanical processes involved (Sairanen and Rinne, 2019).

The dust particles that emanate from stone crushing primarily consists of crystalline silica, a common mineral found in rocks and soil (Wong et al., 2023). The size of the dust particles varies with the crushing equipment and processes employed (Der Does et al., 2018). Fine-grained dust is more likely to be inhaled deeper into the respiratory system and can pose a higher health risk (Gottesfeld et al., 2018).

2.4 HEALTH EFFECTS OF OCCUPATIONAL EXPOSURE TO DUST

Table 2.1 summarizes the adverse effects of occupational exposure to dust.

Table 2.1 Adverse health effects of occupational exposure to various dusts

Occupational exposure effects to dust	Dust particles	Reference(s)
Slicosis Lung cancer Chronic obstructive pulmonary disease	Crystalline silica	Jessica Yi et al. (2024) Neacsu et al. (2023)
Cerussitis Chronic lung disease leading to fibrosis and scarring	lead oxide dust	CDC (2018)
Lung cancer Lung disease	asbestos dust	IARC (2010)
Siderosis Chronic lung disease Fibrosis and scarring.	iron oxide dust (FeO)	CDC (2019).

2.5 KNOWLEDGE AND PERCEPTIONS OF DUST EXPOSURE AMONG INFORMAL STONE CRUSHERS

Table 2.2 shows relevant studies done on knowledge and perceptions on dust exposure among stone crushers. Sample sizes range from 6 to 406 participants. Participants include stone crushers, quarry workers, and stone masonry workers. Gender: Mostly male, with some studies including both males and females. There is no specified dust, but likely silica dust and respirable crystalline silica from stone crushing, quarrying, and other related activities.

Knowledge about dust prevention and health effects varied, ranging from moderate to high. Perceptions about dust exposure and occupational hazards were mostly negative, with some positive perceptions.

Inconsistent use of personal protective equipment (PPE) with some studies reporting positive perceptions and others reporting lack of use or negative perceptions. Respiratory problems such as lung deterioration, and injuries were reported in some studies. Studies were conducted in various

regions, including Australia (6 quarry sites), Nigeria (North central region, Sabon-Gari sector, Abia state), Zambia (Kalingalinga area, Lusaka), Bangladesh (Eastern region), India (Kumaon Region, Uttrakhand; Wokha District, Nagaland) and Nepal.

Table 2.2 Relevant studies done on knowledge and perceptions of dust among stone crushers

Reference	Features of the study	Main findings
Noi et al. (2024)	- six samples - six different Australian quarry sites - Used steel balls	- moderate knowledge on dust prevention - negative perceptions on importance of wearing PPE
Upadhyaya (2024)	- 18 samples, six from each district - Chitrakoot, Banda and Mahomba districts of Bundelkhand region, - filtration method (High Volume Sampler)	- highly knowledgeable on processes which produce dust - positive perception on the preventative measures
Chileshe et al. (2023)	- sample size of 20 people - kalingalinga area of Lusaka Zambia - desk reviews and interviews	- moderate perception on occupational dust effects - moderate perception on occupational regulations - knowledgeable of dust effects
Okoh et al. (2023)	-sample size of 131 stone crushers -North central region of Nigeria -Semi structured interview and questionnaire	- highly knowledgeable on health effects -negative perception on occupational dust exposure
Kaoje et al. (2018)	- 156 informal small scale quarry workers - Sokoto, Nigeria	- negative perception on occupational exposure to dust - poor knowledge on the health effects from dust
Arya and Sharma, 2021	- 120 male stone masonry workers - Kumaon Region of Uttrakhand in National district under Dhari block - used a check list	- negative perception on the risks associated with their work - lack of PPE which led to injuries e.g. cuts from tools, eye injuries from dust particles

		- moderate knowledge of using proper PPE
Islam et al., 2023	- 12 stone crushing factories - Eastern Bangladesh - used questionnaire	- 1/3 of injuries from dust, improper lifting and handling techniques - positive perception, inadequate practices on o ccupational hazards but
Okorie et al., 2023	- 406 quarry workers - used interviews and questionnaires - Abia state, Nigeria	- negative perception on the use of PPE - lack of knowledge concerning the adverse effects of occupational dust exposure
	- 152 male stone quarry workers - Wokha District of Nagaland, North East India - blood pressure test, oxygen saturation,	- higher exposure to dust leading to lung deterioration - moderate knowledge on dust exposure

2.7 SCORING FOR LEVELS OF KNOWLEDGE AND PERCEPTIONS

The Likert scale and nominal scale are two commonly used methods for scoring responses (Radlova et al., 2020). The Likert scale assesses the level of agreement or disagreement with a statement, while the nominal scale categorizes responses into distinct groups (e.g., "yes", "no", or "not sure") (Traill et al., 2024). Both methods are straightforward, easy to use, and enable standardized evaluation (Posey 2024). In the context of knowledge and perceptions of dust exposure, the Likert scale has been used to assess knowledge and perceptions among construction workers (Zhang et al., 2020), evaluate the effectiveness of dust safety training programs (Liu et al., 2019), and measure attitudes towards dust control measures among miners (Moyo et al., 2018).

2.8 THEORETICAL FRAMEWORK

The social ecological model (SEM) (Fig.2.1) was used to guide the study. The social ecological model is a theoretical framework that explains the interactions between individuals and their social and physical environment (Johnson et al., 2020). It can be used to examine dust exposure as a complex issue influenced by factors at multiple levels (Wold et al., 2018). It shows how stone crushers perceive the severity of dust exposure, its consequences for their personal health and the overall workplace environment, and their susceptibility to dust-related illnesses (Moris et al., 2020).

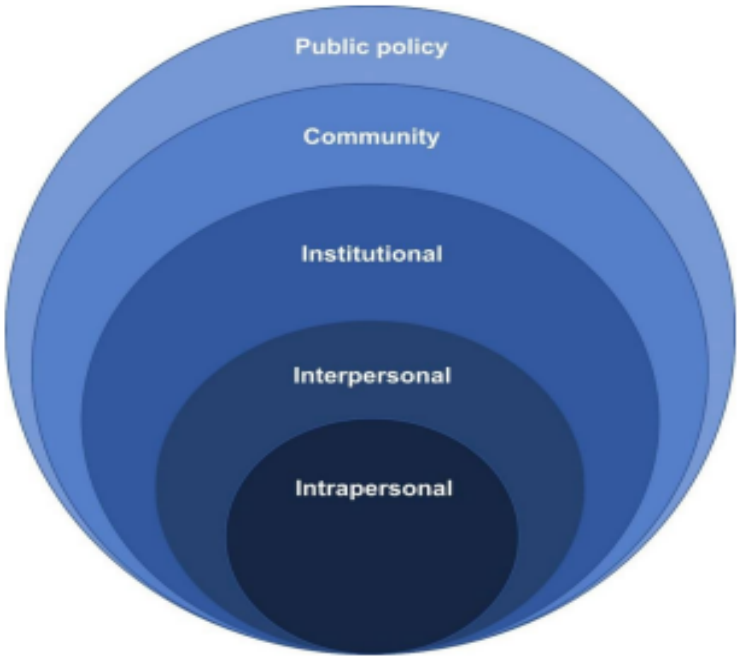

Fig 2.1 The Social ecological model (Bronfenbrenner, 1997) adapted from a social-ecological model of working from home during COVID-19 (Pawluk et al., 2023).

2.9 SUMMARY

The review of literature reveals that while studies may exist on dust exposure in the stone crushing industry, they generally focus on formal well-resourced settings. This leaves a critical knowledge void concerning the specific experiences of informal crushers, who often operate with limited safety measures and resources. The current debates and research interests in the field of occupational health and safety highlight the need for context-specific studies that address the unique challenges faced by informal stone crushers. This study aims to fill this knowledge void by investigating dust exposure and its health impacts on informal stone crushers in resource-constrained settings, providing valuable insights into the specific experiences and challenges faced by this vulnerable population.

CHAPTER 3: METHODS AND MATERIALS

3. METHODS AND MATERIALS

3.1 DESCRIPTION OF STUDY AREA

Chitungwiza, (17.83°S, 31.27°E; 1500 m asl) is a town near Harare, Zimbabwe (Fig. 3.1). It has a population of 391 000 people (ZimStat, 2022). There are various informal stone crushing activities around the town. The town has an estimated unemployment rate of about 30% (Zimstat, 2022) resulting in mushrooming of many small-scale enterprises, the majority working in the informal sector.

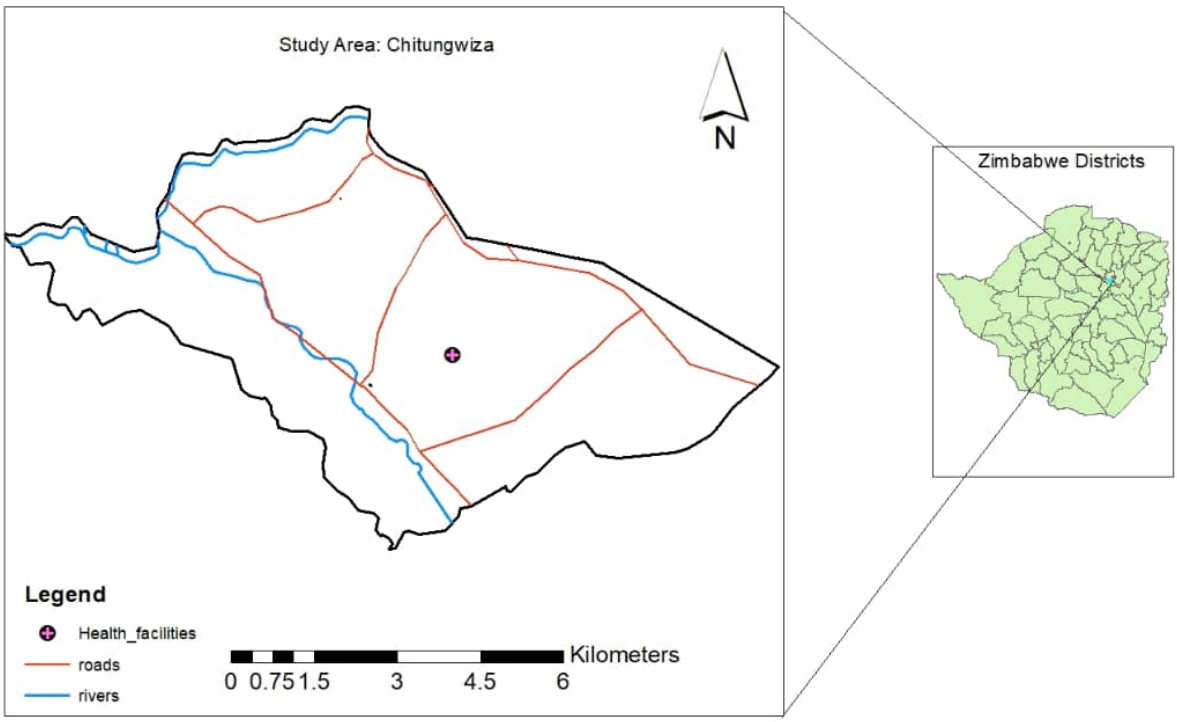

Fig 3.1 Map showing location of Chitungwiza town

3.2 RESEARCH DESIGN

The study adopted a cross-sectional survey research design. It allows for data analysis from a population at a single point in time (Xiafeng et al., 2020). The design involves was considered suitable for the study because it is appropriate in for exploring knowledge and perception of a specific population at a particular point in time (Kumar et al., 2019). Its advantages include quick

data collection, cost effective and ability to determine prevalence rate (Cresswell et al., 2018). It was reportedly used in similar studies (Chauhan et al., 2019; Kermode et al., 2020).

3.3 DETERMINATION OF SAMPLE SIZE

A purposive sample size of 47 working within the same area was considered. Earlier studies have used sample sizes ranging from 6 to 406 depending on various circumstances. For example, previously used sample sizes of informal stone crushers were 18 (Upadhyaya, 2024), 20 (Chileshe et al. 2023)), 120 (Arya et al., 2021) and 406 (Okorie et. al., 2023).

3.4 RECRUITMENT AND SELECTION

The study was conducted in Chitungwiza area, targeting composite groups of informal small-scale stone crushers in the area. After conveniently identifying potential participants of 18 years and above, a random selection followed. It included those residing and working in Chitungwiza and also those who were willing to participate. The researcher Identified 60 potential participants in the area and then used random sampling to select 47 participants for the study.

3.5 ETHICAL CONSIDERATIONS

Applicable ethical issues considered when conducting research involving human subjects as described by (Artal et al., 2017) were observed. These included (i) confidentiality, (ii) anonymity, (iii) voluntary participation, (iv) benefice, (v) non-maleficence and justice. Participants gave their informed consent verbally after being made aware of the study's objectives and how they were to be involved as research subjects. The study was cleared by Bindura University of Science Education through the Department of Environmental Science (Appendix 1) and the local town council (Appendix 2).

3.6 RESEACH INSTRUMENT

A closed-ended pre-tested questionnaire (Appendix 3) was used to collect data from participants. The instrument was developed from literature (Bopara et al., 2018; Aithal et al., 2020). It was organised into demographic characteristics, knowledge and perceptions of participants. The questionnaire is generally used in cross-sectional surveys to gather descriptive data (Fisher, 2019). Its advantages include that it can quickly gather responses and cost-effective (Kumar et al., 2020). Its shortcomings include that it cannot collect data on human feelings and emotions, and that it is

prone to reporting bias (Dencker et al., 2018). To prevent misinformation and confusion, the vernacular was used to interview participants (Hiller et al., 2019). Further, the questionnaire was pilot-tested (Nelson et al., 2020).

3.7 DATA COLLECTION

The questionnaire was self-administered to 47 stone crushers from 15 to 16 May, 2024 in the study area. The purpose of the study and its importance was explained before participants were asked for consent to participate. Questionnaire items were presented in the local vernacular language. Appropriate responses from participants were captured during the interview at site where observations were also made.

3.8 DATA MANAGEMENT

Questionnaires were checked for completeness and accuracy before data were then entered into a MS Excel spreadsheet. Errors were checked by re-entering about 20% of the entered data (Samar et al., 2020). To determine the levels of knowledge and perceptions on dust exposure among informal stone crushers, the comparative analysis scoring system (CASS) (Fisher, 2019) was used. The CASS is a technique for assessing people's views and expertise about a certain subject (Boparad et al., 2018), like dust exposure in informal stone crushers.

CASS compares answers to a series of questions or statements and calculates a score according to how much each statement is agreed upon or disagreed with. The CASS has reportedly been used in similar work (Rahman et al., 2019; Aithal et al., 2020; Singh et al., 2020). Chi-square analysis was used to determine any significant association between demographic characteristics of participants and their knowledge and perceptions on dust exposure. This was done by creating a contingency table to examine the relationship between the demographic characteristics (e.g., age, gender, education level) and the levels of knowledge and perceptions on dust exposure, and then calculating the chi-square statistic and p-value to determine the significance of the association (Gravetter et al., 2019).

CHAPTER 4: RESULTS

4. RESULTS

4.1 CHARACTERISTICS OF PARTICIPANTS

Table 4.1 shows the characteristics of the participants for the study. Results indicate that about ¾ of the participants were male (72.3%). Almost half of the participants had primary level education (48.9%). The majority of the participants had no prior training on occupational exposure to dust (87.2%).

4.2 LEVEL OF KNOWLEDGE OF PARTICIPANTS

Table 4.2 Show the level of knowledge of participants on occupational exposure to dust. Results show that the level of knowledge was moderate (44.71%). This indicates that while some participants had a good understanding of the risks associated with dust exposure, others had limited knowledge. Specifically, 31.9% (15/47) of participants correctly answered that stone crushing affects the respiratory system most, 60.9% (28/47) correctly answered that one should be stationed in the windward side when working.7% (21/47) correctly answered that they experience dust-related health problems.

The majority of participants (68.1%) knew that windward positioning is important when working with dust. Less than half of the participants (19.1%) had received awareness/training on dust exposure and health risks. Most of the participants (63.8%) experienced dust-related health problems. Only 31.9% of participants knew that stone crushing affects the respiratory system most

4.3 LEVEL OF PERCEPTIONS OF PARTICIPANTS

Table 4.3 shows the level of perceptions of participants. Results indicate that the level of perceptions was negative (39.28%). This indicates that participants generally perceived dust exposure as a significant health risk, but had some misconceptions about the effectiveness of preventive measures. About 63.8% (30/47) of participants believed that stone crushing has health risks, 51.1% (24/47) perceived that men have potential health risks by stone crushing. 46.8% (22/47) believed that drinking milk after exposure to dust prevents illnesses (contrary to fact).

The majority of participants (63.8%) believed that stone crushing has health risks. More than half of the participants (51.1%) perceived that men have potential health risks by stone crushing. Almost half of the participants (46.8%) believed in the misconception that drinking milk after exposure to dust prevents illnesses. Only 34% (16/47) believed that dust exposure can cause long-term health problems.

Table 4.1 Characteristics of participants (*n =47*)

Questionnaire item	Response category	Freq. # (%)
Gender	Male	34 (72.3)
	Female	13 (27.7)
Level of education	No formal education	6 (12.8)
	Primary level	23 (48.9)
	Secondary level	13 (27.7)
	Tertiary level	5 (10.6)
Training of respondents	Yes	6 (12.8)
	No	41 (87.2)
Work experience (years)	< 2	15 (31.9)
	2 - 5	20 (42.6)
	6 - 10	11 (23.4)
	> 10	1 (2.1)
Age group (years)	18 - 25	3 (6.4)
	26 – 35	20 (42)
	36 - 45	11 (23.4)
	46 - 55	10 (23.4)
	56 and above	3 (6.4)
Marital status	single	11 (23.4)
	married	26 (55.3)
	divorced	3 (6.4)
	Widow/widower	7 (10.6)

Table 4.2 Level of knowledge of participants (*n = 47*).

	Questionnaire item	Response (#, %)			Scoring	
		Yes	No	Not sure	Preferred response	Score %
B1	Stone crushing affects the respiratory system most	15 (31.9)	27 (57.4)	5 (10.6)	YES	31.9
B2	There may be hazardous substances in the dust too	28 (59.6)	13 (27.7)	6 (10.5)	YES	60.9
B3	When working you should be stationed in the windward side	32 (68.1)	9 (19.1)	6 (12.8)	NO	19.1
B4	Do you think wearing PPE helps prevent exposure?	26 (55.3)	15 (31.9)	6 (12.9)	YES	55.3
B5	Do you have awareness/training on dust exposure & health risks?	9 (19.1)	38 (80.9)	0	YES	19.1
B6	Children, pregnant women & old people are most affected by dust	21 (44.7)	18 (38.3)	8 (17)	YES	44.7
B7	Do you experience dust-related health problems?	30 (63.8)	12 (25.5)	5 (10.6)	YES	63
B8	Dry windy days make you most exposed to dust when working	23 (48.9)	14 (29.8)	10 (21.3)	YES	48.9
B9	The skin and back can also be affected by stone crushing	27 (57.4)	12 (25.5)	8 (17)	YES	57.4
B10	Smallest dust particles can enter lungs to cause health problems	22 (46.8)	14 (29.8)	11 (23.4)	YES	46.8
	Mean score	**Level = Moderate (44.71%)**				**44.71**

Levels of knowledge: Good (70 -100%), Moderate (40 - 69%), Poor (0 - 39%)

Table 4.3: Participants responses on the perceptions of occupational dust exposure

	Perception questionnaire item	Response (#, %)				
		Yes	No	Not sure	preferred response	Score %
C1	Do you belief that stone crushing has health risks?	30 (63.8)	10 (21.3)	7 (14.9)	YES	63.8
C2	Do you perceive that men have potential health risks by stone crushing?	24 (51.1)	12 (25.5)	11 (23.4)	YES	51.1
C3	Drinking milk after exposure to dust prevents illnesses	22 (46.8)	11 (23.4)	14 (29.8)	NO	23.4
C4	Do you believe that dust exposure can cause long-term health problems?	16 (34)	23 (48.9)	8 (17)	YES	34
C5	Wearing overalls or masks make one not able to work freely	12 (25.5)	24 (51.1)	11 (23.4)	YES	25.5
C6	Watering your work area reduces dust spreading but makes work difficult	15 (31.9)	20 (42.6)	12 (25.5)	YES	46.8
C7	Working exposed to dust has no health threats as long as one prays	22 (46.8)	18 (38.3)	7 (14.9)	NO	38.3
C8	Short working period in stone crushing makes one free from health risks	20 (42.6)	17 (36.2)	10 (21.3)	NO	36.2
C9	Preventive measures make one work in stone crushing without exposure to hazards	17 (36.2)	24 (51.1)	6 (12.8)	YES	36.2
C10	Working as family with children makes work ease and completed fast reducing exposure to hazards	27 (57.4)	12(.25.5)	8 (17)	NO	37.5
	Mean score	**Level = Negative (39.28%)**				**39.28**

Levels of perceptions: Positive (70 -100%), Moderate (40 - 69%), Negative (0 - 39%)

4.4 ASSOCIATION BETWEEN DEMOGRAPHIC DATA OF PARTICIPANTS AND KP

Table 4.4. Shows the association between knowledge and perceptions, with demographic data of participants. Results indicate that there was a significant association between the knowledge level and the level of education ($\chi^2 = 14.098$, $p = 0.029$) and a significant association between the perceptions and work experience ($\chi^2 = 18.947$, $p = 0.004$)

Table 4.4 Association between knowledge and perceptions, with demographic data of participants (*n =47*)

Demographic variable	Knowledge		Perceptions	
	χ^2	p	χ^2	p
Gender	3.128	0.209	1.726	0.422
Level of education	14.098	**0.029**	13.862	0.031
Training	3.524	0.172	3.836	0.147
Work experience	12.786	0.047	18.947	**0.004**
Marital status	10.783	0.095	14.627	0.023
Age group	14.373	0.073	15.533	0.050

p value in bold denotes significant association ($p < 0.05$)

CHAPTER 5: DISCUSSION

5. DISCUSSION

5.1 INTRODUCTION

This chapter interprets and explains observed results in view of related literature and knowledge of the study area where appropriate. It presents the levels of knowledge and perceptions of participants, and the association between their demographical data and knowledge and perceptions.

5.2 CHARACTERISTICS OF PARTICIPANTS

The demographic characteristics of the respondents in the study are notable. The majority of respondents are male (72.3%), indicating a gender imbalance in the industry (Oluwoye et al., 2021). Furthermore, the level of education is predominantly primary (48.9%), suggesting a lack of access to higher education (Muya et al., 2020). Alarmingly, a significant proportion of respondents (87.2%) reported having no training, highlighting the need for capacity building programs (Kumar et al., 2020). Lastly, the age group of 26-35 is the most represented (42%), indicating a relatively young workforce (ILO, 2018).

5.3 LEVEL OF KNOWLEDGE OF PARTICIPANTS

The participants in the study exhibited a moderate level of knowledge in occupational safety (44.71%). This finding can be attributed through effective safety training programs and awareness campaigns implemented in the workplace (O'Connor et al., 2020). Research has shown that training programs can improve workers' knowledge and attitudes towards occupational safety (Zhang et al., 2019). A positive safety culture within the group also likely played a role in the moderate level of knowledge in occupational safety (SafetyCulture, 2022). A positive safety culture encourages employee participation, engagement, and commitment to safety, leading to a better understanding of occupational safety principles. Furthermore, the educational background of the participants may have also influenced their level of knowledge in occupational safety. Studies have shown that higher educational qualifications are associated with better knowledge of occupational safety (Jubayer, 2020).

5.4 LEVEL OF PERCEPTIONS OF PARTICIPANTS

The participants had negative (39.28%) perceptions regarding various aspects of safety in the workplace. Firstly, lack of awareness and understanding of occupational safety principles can contribute to a negative perception of safety (Chau et al., 2021). When workers are not adequately trained or informed about safety protocols, they may view safety as a secondary concern, leading to a negative perception (Huang et al., 2018).

5.6 ASSOCIATION BETWEEN KP AND DEMOGRAPHIC CHARACTERISTICS OF PARTICIPANTS

The findings of this study suggest that there is a significant association between level of education and knowledge, work experience, and perceptions. This is consistent with previous research that has shown that higher levels of education are associated with better knowledge and understanding of occupational safety and health (OSH) principles (Zhang et al., 2020). Similarly, work experience has been shown to be an important factor in shaping workers' perceptions of safety, with more experienced workers tend to have a more positive perception of safety (Huang et al., 2019). The association between education, knowledge, and perceptions can be attributed to the fact that higher levels of education provide individuals with a better understanding of OSH principles and practices, which in turn influences their perceptions of safety (Chau et al., 2021).

5.5 SUMMARY

The study examines the knowledge and perceptions of occupational dust exposure among informal sector stone crushers. The participants were mostly male, had primary education, and lacked training. They showed a moderate level of knowledge (44.71%) and negative perceptions (39.28%) regarding workplace safety. The study found a significant association between education, work experience, and knowledge and perceptions. Current research emphasizes the importance of training, awareness, and positive safety culture in improving knowledge and perceptions of occupational safety. This study aligns with these findings and highlights the need for capacity building programs and education to address the knowledge and perception gaps among informal sector stone crushers.

Current research interest appears to focus on the importance of education, training, and positive safety culture in improving knowledge and perceptions of occupational safety. This study matches up with these interests and highlights the need for targeted interventions to address the specific challenges faced by informal sector stone crushers.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6. CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

The study found out that the participants had moderate knowledge (44.71%), negative perceptions (39.28%) occupational dust exposure. The participant' level of education and work experience were both significantly associated with knowledge of occupational safety ($p < 0.05$). The originality of the study lies in its examination of the participants' KP under resource-constrained settings. Associations between demographic characteristics and KP do not demonstrate causality. Further work could explore the cause-effect relationship. Training and awareness programmes may be used to address shortcoming of having good knowledge but poor perceptions

6.2 RECOMMENDATIONS

- Provide targeted educational training and education on occupational health hazards, specifically on dust exposure and its effects on respiratory health.
- Develop and implement a comprehensive awareness program to address misconceptions and negative perceptions about dust exposure and PPE usage.

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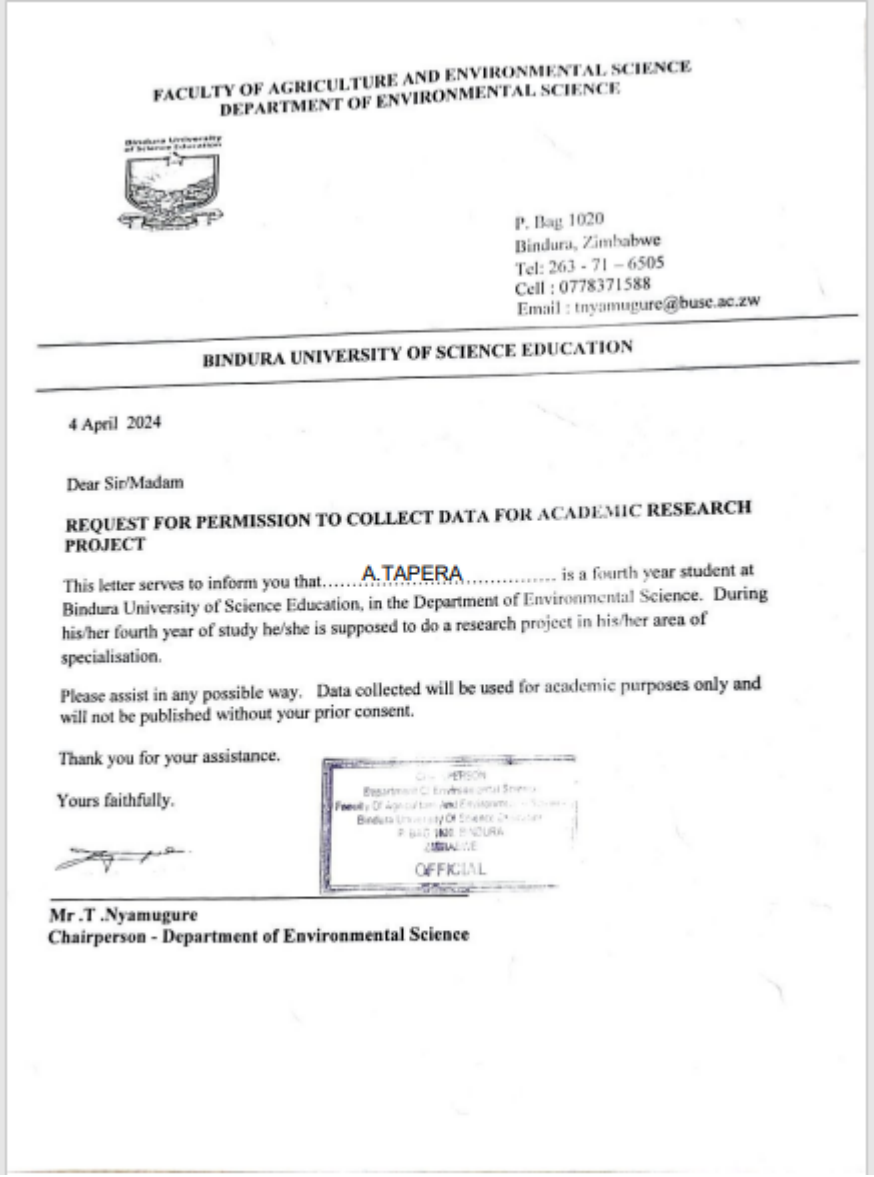
APPENDICES

APPENDIX 1: Data Collection permission later from Bindura University.



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BINDURA UNIVERSITY OF SCIENCE EDUCATION

4 April 2024

Dear Sir/Madam

REQUEST FOR PERMISSION TO COLLECT DATA FOR ACADEMIC RESEARCH PROJECT

This letter serves to inform you that.....A.TAPERA..... is a fourth year student at Bindura University of Science Education, in the Department of Environmental Science. During his/her fourth year of study he/she is supposed to do a research project in his/her area of specialisation.

Please assist in any possible way. Data collected will be used for academic purposes only and will not be published without your prior consent.

Thank you for your assistance.

Yours faithfully.

OFFICIAL

Mr .T .Nyamugure
Chairperson - Department of Environmental Science

APPENDIX 2: APPROVAL LETTER FOR DATA COLLECTION

Town Clerk

Chitungwiza Municipality

P.O Box 70

Chitungwiza

Tel: 070 - 23001 – 4

16 April 2024

The Chairperson

Department of Environmental Science

Bindura University of Science Education

Bindura

Dear Sir

REF: PERMISSION TO CONDUCT AN ACADEMIC RESEARCH PROJECT

Reference is made to the above subject, as Chitungwiza Municipality we hereby grant Tapera Anesu V (B201649B) permission to carry out the research, within our town. We do believe that the research will be of significance to us as a local authority.

Your usual co-operation, presence and participation will be highly appreciated.

Thank you.

Yours faithfully

Environmental Health Officer

FOR THE TOWN CLERK

APPENDIX 3: QUESTIONNAIRE ON THE KNOWLEDGE AND PERCEPTIONS OF OCCUPATIONAL DUST EXPOSURE AMONG INFORMAL SECTOR STONE CRUSHERS UNDER RESOURCE CONSTRAINED SETTINGS.

BINDURA UNIVERSITY OF SCIENCE EDUCATION

DEPARTMENT OF ENVIRONMENTAL SCIENCE

Questionnaire ID:

INTRODUCTION

My name is Anesu V Tapera (B201649) studying towards a BSc (Honors) degree in Safety, Health and Environmental Management at Bindura University of Science Education (BUSE). It is a requirement that during the final year one conducts a field study. My research title is titled Knowledge and perceptions on occupational exposure to dust among informal sector stone crushers under resource-constrained settings: case of Chitungwiza, Zimbabwe. Information shared is only used for academic purposes and cannot be traced back to you. If you agree to participate it means I have your informed content.

INSTRUCTIONS TO RESPONDENTS
Please do not write your name on the questionnaire.
Tick the appropriate response.

SECTION A: DEMOGRAPHIC INFORMATION

A1. Gender **1.** Male **2.** Female

A2. Marital Status: **1**. Single **2**. Married **3**. Divorced. **4**. Widower/widowed

A3. Highest level of education attained:

1. No formal education **2**. Primary **3**. Secondary **4**. Tertiary

A4. Age group (years): **1**. 18 – 25 **2.** 26 – 35 **3**. 36 - 45 **4**. 46 – 55 **5**. 56 and above

A5. Work experience (years): **1**. Less than 2 **2**. 2 – 5 **3**. 6 – 10 **4**. Above 10

A6. Do you have any training in stone crushing? **1.** Yes **2.** No

Section B: Knowledge on occupational dust

Code	Questionnaire item	Responses		
		1. Yes	**2**. No	**3**. Not sure
B1	Stone crushing affects the respiratory system most			
B2	There may be hazardous substances in the dust too			
B3	When working you should be stationed in the windward side			
B4	Do you think wearing PPE helps prevent exposure?			
B5	Have you ever received awareness/training on dust exposure and health risks?			
B6	Children, pregnant women and old people are most affected by dust			
B7	Do you experience dust-related health problems?			
B8	Dry windy days make you most exposed to dust when working			
B9	The skin and back can also be affected by stone crushing			
B10	The smallest dust particles can enter the lungs to cause health problems			

Section C: Perception on risks and prevention

Code	Questionnaire item	Responses		
		1. Yes	**2**. No	**3**. Not sure
C1	Do you believe that stone crushing has health risks?			

C2	Do you perceive that men have potential health risks by stone crushing			
C3	Drinking milk after exposure to dust prevents illnesses			
C4	Do you believe that dust exposure can cause long-term health problems?			
C5	Wearing overalls or masks make one not able to work freely			
C6	Watering your work area reduces dust spreading but makes work difficult			
C7	Working exposed to dust has no health threats as long as one prays			
C8	Working in stone crushing for a short period makes one free from health risks			
C9	One work in stone crushing without being exposed to hazards provided there are preventive measures			
C10	Working together as family with children makes work ease and completed fast, and reduces exposure to hazards			

THE END