Original Research Article

Resident perceptions on the health risks associated with solid waste disposal at Kalundu Dumpsite, Kitui County – Kenya on the surrounding human settlement

ABSTRACT

Aims: Urban centers of developing countries are growing at very rapid rates. This has been accompanied by increased use of resources and enormous waste generation. The generated waste is dumped in the outskirts of the urban where they can have negative impacts on the environment and surrounding human settlements. This study therefore aims to assess the perceived health risks of Kalundu dumpsite in Kitui Town, Kitui County of Kenya.
Study design:A survey design was used to collect data from people living within 500 meter radius of Kalundu dumpsite
Place and Duration of Study: This study was carried out between January 2020 and December 2020 in Kitui Town of Kitui County, Kenya.
Methodology:A Semi - structured questionnaire was administered to 78 respondents to collect data on perceived health risks they associate with the presence of Kalundu dumpsite in their locality. The collected data was coded and then analyzed. Pearson Correlation Coefficient was used to test the link between respondent characteristics and perceived health risks.
Results:83.3% of respondents perceived the presence of the dumpsite in their vicinity as a health hazard that they attributed to cause diseases (Malaria, chest pain; diarrhea, and cholera) and other negative environmental effects (smoke, odour, and habitat for disease vectors and pathogens). Children under the age of 5 years were the most vulnerable
Conclusion: There is a perceived link between waste deposited onto Kalundu dumpsite and human and environmental health of the surrounding community.

Keywords: Dumpsite, health risks, solid waste, Kalundu, waste management, developing countries, Kitui-Kenya

1. INTRODUCTION

In recent years, the world population is rapidly increasing with a majority of the increase experienced in urban areas (Liu et al., 2020). In Africa, urban population is projected to increase from 395 million in 2009 to 1.23 billion persons in 2050 (UN-Habitat, 2010). This has been characterised by an exponential increase in resource consumption and tremendous increase in waste generation (Ameen&Mourshed, 2017). This process has accelerated in Kenya since the inception of the devolved administration system in after the promulgation of the 2010 Constitution.

In many cases, the generated wastes are thrown into poorly managed waste disposal sites (Rachel et al., 2009), located either within the town centres or on their outskirts (Karak et al.

2012; Smit, 2018). To prevent detrimental effects to the environment and human health (Aluko et al., 2021), these produced wastes must be well managed (Ferronato&Torretta, 2019). Unfortunately, these dumpsites are ineffective and poorly managed and pose greater risks to public health and environment especially to the residents of nearby settlements (Wilson et al., 2009; McGill, 2018).

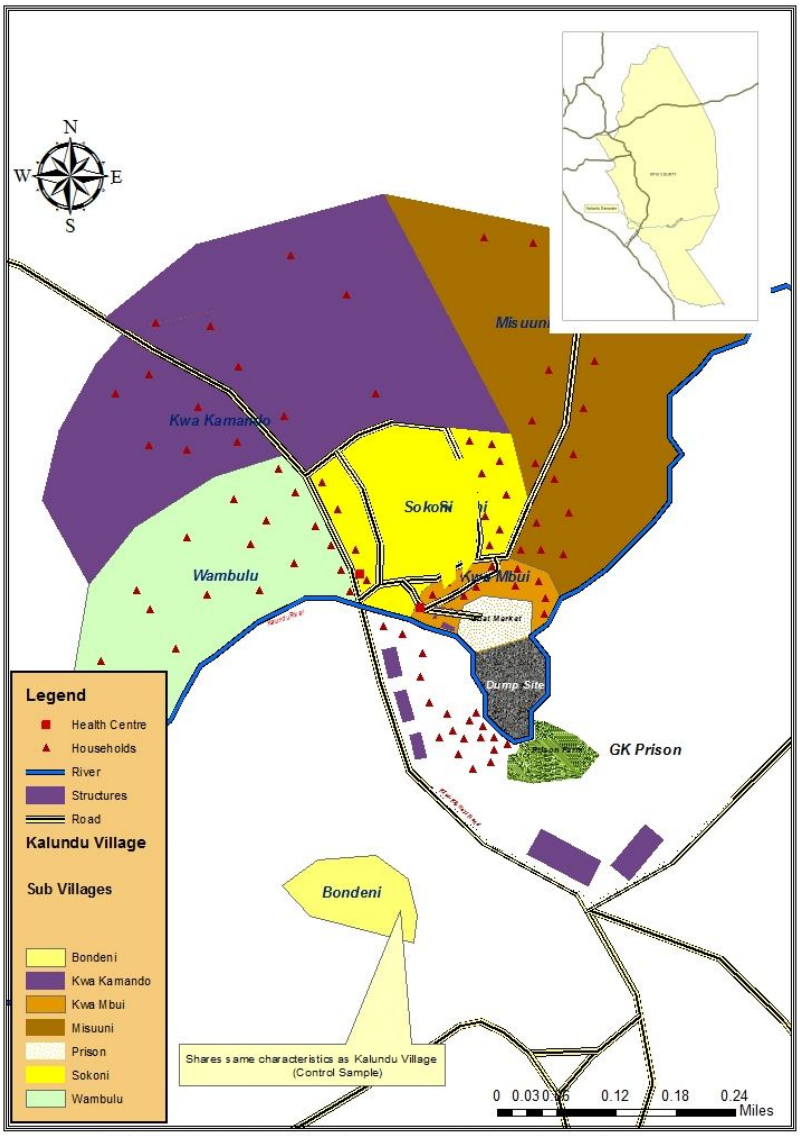
This link has been demonstrated in a number of studies (Aluko& Sridhar 2005; Nwanta 2010; Norsa'adah et al., 2020; Olu&Iyere, 2020; Amugsi et al., 2020; Etea et al., 2021). For example, direct handling of solid organic waste can result in various types of infectious and chronic diseases (Vimercati et al. 2016; Heldal et al., 2013) while chemicals, broken glass, hypodermic needles and other hospital wastes risk injuring or poisoning waste workers or playing children (Davis and Cornwell 2008). Similarly, the waste can cause smells, dust, filth and dirt in residential areas (Rachel et al., 2009) which will adversely affect the air people breath (De Feo et al., 2013; Sakawi et al., 2011; Kumar et. al., 2004); respiratory complications, irritation, and allergies (Vinti et al., 2021) and the public and environmental health (Boningari&Smirniotis, 2016). Furthermore, these waste dumpsites can also provide fertile ground for the proliferation of flies, mosquitoes, rodents and other disease vectors and pathogens.

Open dumping is the preferred method of solid waste disposal (Muiruri et al., 2020). This situation creates suitable conditions for increased health risks to people living closer to dumpsites (Sankoh et al., 2013; Brender et al., 2011; Vrijheid 2000). This scenario also applies to Kitui Town, which is the County headquarters and largest town of Kitui County in Kenya. In Kitui, the Kitui Town Administration unit is responsible for managing all the generated solid waste in Kitui County. The collected waste is dumped at Kalundu dumpsite which derives the name from the adjacent Kalundu slum, a residential area that is surrounded by several businesses, a garage and a cattle traders market. At the edge of the dumpsite, there is the Kalundu River.

Because of its location and the fact that it is not protected or fenced, the dumpsite is a risk to the neighbouring community since it can adversely affect the immediate human health of those living in close proximity. It is therefore necessary to assess the health effects of the dumpsite location to the local community. It is on this background that this study assesses the health effects of solid waste disposal on Kalundu dumpsite in Kitui Town on the surrounding human settlements.

2. METHODOLOGY

This study was carried out in Kitui Town the headquater of Kitui County of Kenya. The town lies between latitudes 0º10 and 3º0 South and longitudes 37º50 and 39º0 East. Kitui County is mostly dry and hot with temperatures ranging between 14°C in July-August and 34°C in January-March with rainfall ranging between 500mm and 1050mm annually. Kalundu open dumpsite is currently the only disposal site for all the solid waste generated and collected in the town. The dumpsite lies in Kitui Central Sub County, Kitui Township Ward in Kalundu village.



CONTEXTUAL REPRESENTATION OF THE KALUNDU DUMPSITE IN KALUNDU LOCALITY, KITUI COUNTY- KENYA

Fig. 1. Location of Kalundu Dumpsite in kalundu localityof KituiTown, KituiCounty – Kenya.Source; GIS Field Survey

For this study, a survey was used to collect data from people living close to the dumpsite vicinity in a radius of 500 meters. In order to assess the perceptions of people living close to the dumpsite on the health risks, the respondents were stratified into two categories (i) those very close to the dumpsite (less than<250 meters), and those beyond 250 meters but within the 500 meters range. The number of respondents was determined using the formula by Kothari (2004).

$$n = \frac{z^2 pqN}{e^2 (N - 1) + z^2 pq} \quad \text{.....Equation 1}$$

Where:

n: is the sample size for a finite population (smaller than 50,000)
N: size of the population = 800 households (Kalundu village)
p: population reliability (or frequency estimated for a sample of size n), where p is 0.5 which is taken for all developing countries population and p + q= 1
e: margin of error = 10%
Z- normal reduced variable at 5% level of significance (which is 1.96)

From the formula, 78 respondents were selected representing 39 from each stratum. A structured questionnaire was then administered to the respondents to collect data on their perceived health risks they associate with the presence of the dumpsite in their locality. The collected data was then coded and inputted into the Statistical Package for Social Sciences (SPSS) for analysis.
Pearson Correlation Coefficient was used to test the links between respondent characteristics, household location from the dumpsite and the health perceptions. Participation was voluntary, and the respondent's privacy and anonymity was guaranteed.

3. RESULTS AND DISCUSSION

3.1 Demographic and socio-economic characteristics of the respondents

Out of the 78 respondents, 50 were male while 28 were female. The respondents' ages ranged from 29 to 35 years. Majority of them were primary school leavers with those who had attained secondary school level representing 32% and only 10.3% had proceeded beyond secondary education. 56.4% of the respondents within 250 m from the dumpsite (near the dumpsite) were self-employed. This category was represented by 51.3% for those further than 250 m but within 500 m of the dumpsite (far from dumpsite). The average monthly earnings were below Ksh.10, 000, basically translating to below 3 dollars in a day. This low education and employment status of residents contributed to them resolving to make a living through solid waste scavenging. Here, they collected waste valuables for sell thereby exposing themselves to increased risk of health hazard exposure, cases that have been reported in other studies (Bradney et al., 2019; Naidoo &Rajkaran, 2020; Silva et al., 2021).

3.2 Perceived health risks associated with waste dumping at kalundu dumpsite

83.3% of respondents were in agreement that Kalundu dumpsite posed a health hazard to the surrounding community and environment (Figure 2).

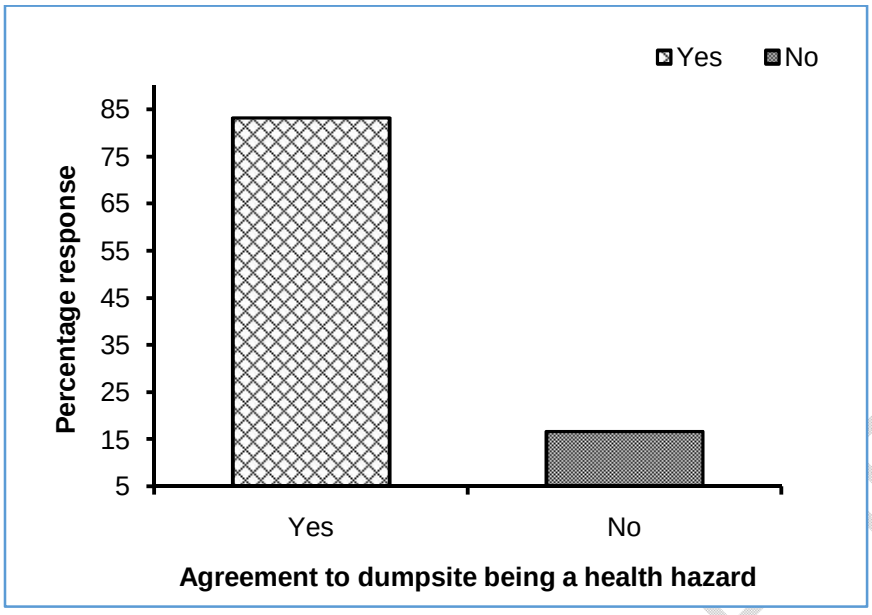


Fig. 2. Respondent view of the dumpsite being ahealth hazard to the people and surrounding environment

Just like in other studies (Milosevic et al., 2018; Nair et al, 2019; Vaverková, 2019; Etea et al., 2021), the perceived health risks reported by the respondents in this study included; smoke emanating from burning waste, odour from rotting organic waste, providing an habitat for breeding mosquitoes, and harboring other disease vectors (Figure 3). These together with high incidence of snake presence in the dumpsite vicinity exacerbate the health risks associated with living in close proximity to Kalundu dumpsite. Further, the respondents noted that the dumpsite together with the overlying human settlement areas, adjacent mechanic garages and livestock market acted as major sources of contamination to their only water source – the Kalundu River. Thus, they were exposed to health risks associated with various forms of water contamination as reported in other studies (Sibanda et al., 2017; Waturu et al., 2017; Awino, 2020; Aluko et al., 2021). There was an indication of water contamination evidenced through waste spilled from dumpsite lying along the bank of Kalundu River (Figure 4).

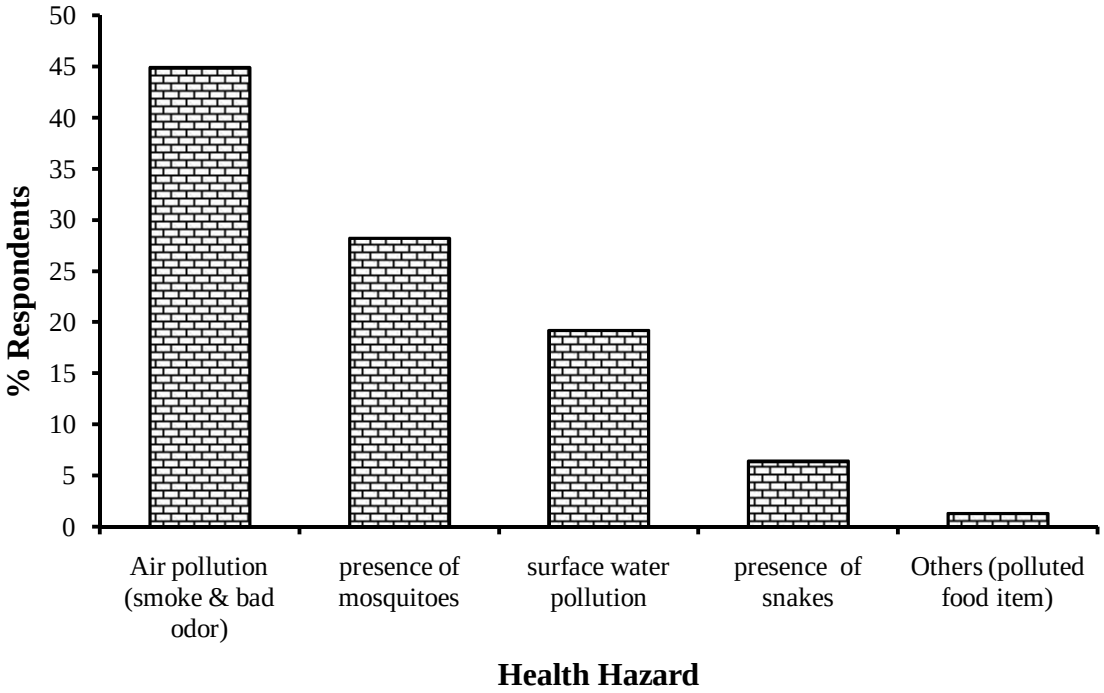


Fig. 3. Perceived health risks associated with presence of dumpsite in the Kalunduneighbourhood

Fig. 4. Waste leakage and spillage along the banks of Kalundu River

According to the respondents, Malaria was the most common disease associated with the presence of the dumpsite within their vicinity (Figure 5). This was attributed to mosquito bites, an indication that the dumpsite provided a conducive habitat for mosquitoes to thrive. This was followed by chest pain; diarrhea and cholera respectively (Figure 5). However, cholera was perceived to be a seasonal disease with high incidences during the rainy season. Skin infections, eye irritation and nose irritation were cited as minor occurrences. This finding corroborate other studies that demonstrate a direct link between health effects and location of dumpsites, thus dumpsites pose significant health risks to the environment and people

living close by (Yongsi, 2008; Giusti, 2009; Gouveia& do Plado, 2010). Kalundu dumpsite is not fenced, waste dumping is indiscriminate and there is no control of who or what entered into it or came out of it. This creates a conducive environment that poses major health risks as reported by the respondents and corroborated by the findings of another study (Sood, 2004). Furthermore, it has been observed and reported that solid wastes that are not well managed offer serious health risks to the surrounding human settlements (Nwogwugwu&Ishola, 2019).

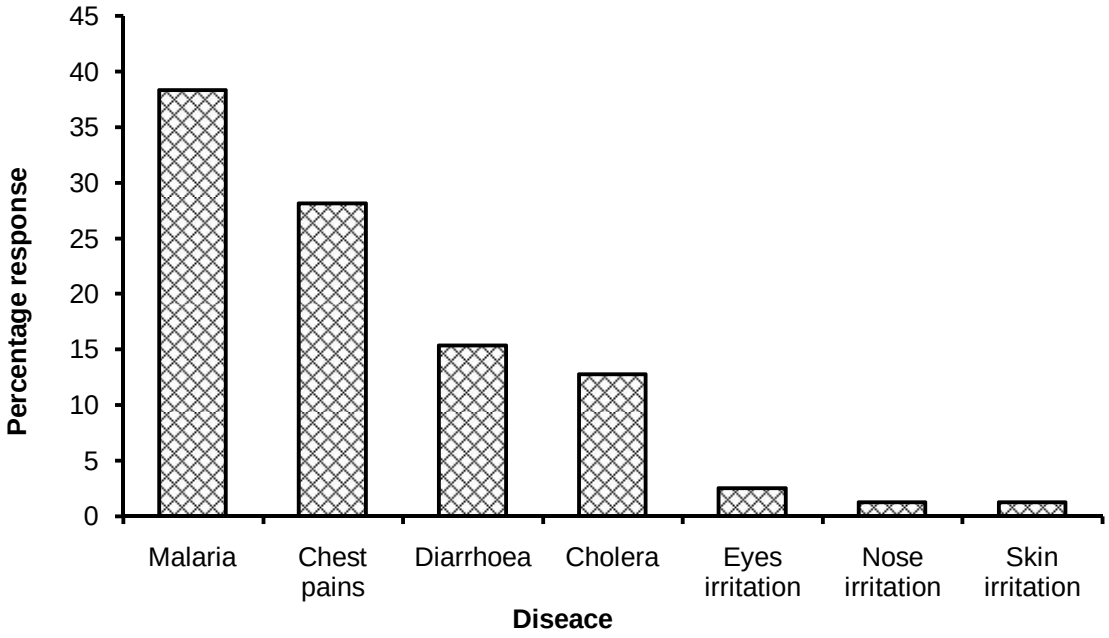


Fig. 5. Perceived disease incidences associated with the presence of Kalundu dumpsite

Although both groups of respondents as per the study demarcation indicated that the dumpsite posed environmental and human health challenges to the community, this study found that those living within 250 m of the dumpsite (near the dumpsite) were more affected (Figure 6; Table 1). It indicates that increasing the distance between settlements and the dumpsite reduces the frequency of illnesses and vice versa (Figure 6). This observation corroborates other studies linking living close to dumpsite and perception of environmental health risks (Okot-Okumu 2008; Gakungu et al., 2012). The study also brought into attention the environmental implications of poor solid waste management at Kalundu dumpsite on land degradation where 53.5% perceived the disposed waste to have a land degrading effect; 55.4% perceived it to be degrading the air while 44.1% perceived the waste as creating unhygienic conditions (Table 1). These effects were more severe in the near the dumpsite settlements compared with the far the dumpsite ones. In contrast, water pollution

was perceived to be very intense or intense by over 75% of respondents residing far from the dumpsite compared to only slightly over 34% of those living near the dumpsite (Table 1).

Further, the result indicates a statistically significant relationship between intensity of air pollution, water pollution and unhygienic environments ($p<0.01$) whilst the association between intensity of land degradation and the study areas was not statistically significant ($p=0.203$) (Table 1).

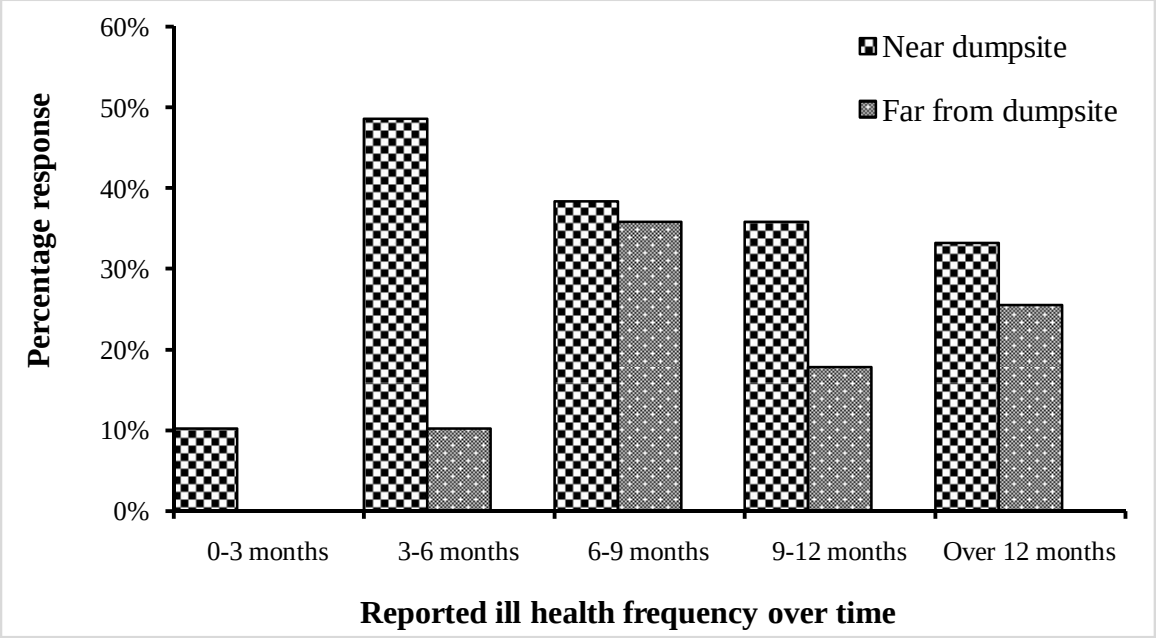


Fig. 6. Relationship between distance from dumpsite and reported frequency of ill-heath cases specified over time

Table 1 Respondents' perceptions on environmental health risks associated with solid waste dumped at Kalundu dumpsite

Environmental implications	Intensity	Near dumpsite	Far from dumpsite	Total
Land degradation	Very intense	52.5%	54.5%	53.5%
	Slightly intense	19.8%	17.8%	18.8%
	Intense	4.0%	10.9%	7.4%
	Not intense	23.8%	16.8%	20.3%
	X^2	4.60		
	P- value	0.203		
Air pollution	Very intense	62.4%	48.5%	55.4%
	Slightly intense	7.9%	25.7%	16.8%
	Intense	7.9%	12.9%	10.4%
	Not intense	21.8%	12.9%	17.3%
	X^2	14.78		
	P- value	0.00***		
Water pollution	Very intense	15.8%	13.9%	14.9%
	Slightly intense	61.4%	11.9%	36.6%
	Intense	8.9%	60.4%	34.7%
	Not intense	13.9%	13.8	13.8
	X^2	72.546		
	P- value	0.00***		
Unhygienic environment	Very intense	80.2%	7.9%	44.1%
	Slightly intense	13.9%	44.6%	29.2%
	Intense	3.0%	31.7%	17.3%
	Not intense	3.0%	15.8%	9.4%
	X^2	109.09		
	P- value	0.00***		

Note ******* indicates significance at 1%

According to the respondents' views, children under the age of 5 years were the most vulnerable to contract disease compared to other age groups. Children from the group living near the dumpsite were more susceptible with 70% of them affected compared to 55% in the group living further away from the dumpsite (Figure 7). Further, responded highlighted the presence of dangerous items that risked injuring or poisoning waste workers and/or playing children, a finding that was also reported by Davis and Cornwell, 2008.

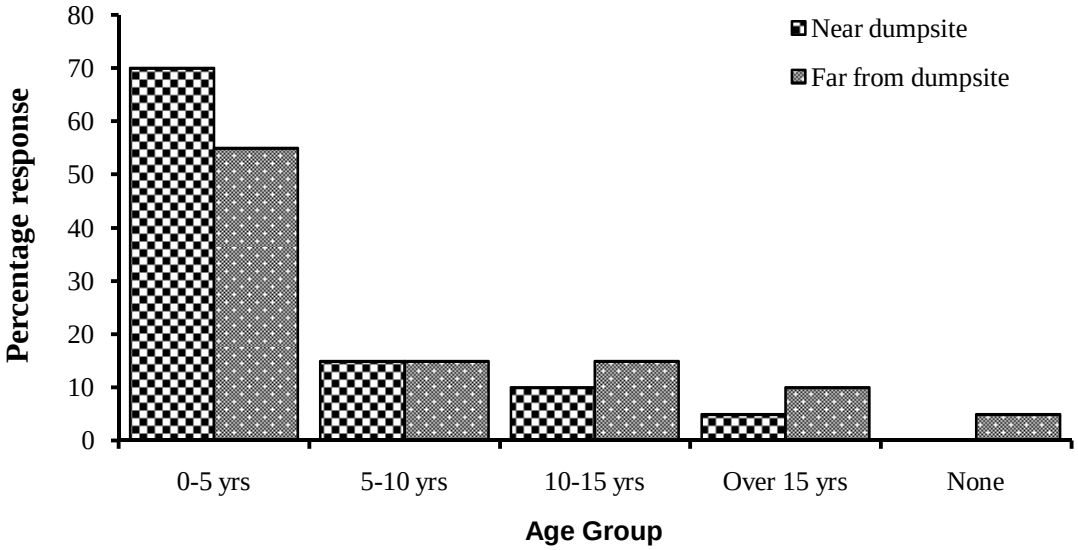


Fig. 7. Age group vulnerability to health risks associated with living in the dumpsite vicinity

4. CONCLUSION

This study concludes that there is a link between waste deposited onto dumpsites and human and environmental health of the surrounding community with those living closer to the dumpsite more vulnerable.

CONSENT

All authors declare that 'written informed consent was obtained from relevant authorities the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

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