

Environmental and Health Impacts from Slaughter Houses Located on the City Outskirts: A Case Study

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Abstract

This paper explores the location of slaughter houses in the city outskirts, describes its functioning and explores its impact on the environment and health of residents living in its vicinity. A medium sized city of North India, Aligarh, was selected for the case study. The study is mainly based on primary sources of data collected through survey of city outskirts, slaughter houses, villages and households located in its vicinity. For in-depth investigation, 2 slaughter houses located in the outskirts, 460 households living in the vicinity of these slaughter houses (0 to 3 km) were randomly selected for sampling. Data were collected with the help of questionnaire. Field surveys revealed that there were innumerable authorized and unauthorized slaughter houses inside the city, Makdoomnagar was the oldest one (1995), individual households in many parts of the city were slaughtering animals in one room, the city outskirts had 6 big slaughter houses and meat processing units and innumerable open illegal ones. Investigations revealed that all the slaughter houses suffer from very low hygienic standards posing both environment and health hazards due to discrete disposal of waste, highly polluted effluent discharge, burning and boiling of bones, hooves, fat, meat, etc. The results show that for the residents living in the immediate vicinity of the slaughter house, both the environmental conditions and their health conditions were worst.

Keywords

Pollution, Environment, Illegal, Waste

1. Introduction

With the growing annual per capita meat consumption and high meat export, the estimated number of animals

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slaughtered has increased from 2.5 million during 2009-2010 to 3.5 million during 2011-2012. The number of cattle slaughtered in India between April 2009 and March 2013 was nearly 8 million [1]. There has also been an increase in the number of slaughter houses in India.

A slaughter house is a facility, where animals are butchered/killed for consumption as food products. In India there are approximately 3600 legal (authorized) and over 32,000 illegal (unauthorized) slaughter houses located both inside and in the city outskirts. All the major Indian cities have central slaughter houses mostly dating back to the British period (>70 years old). Most of them are creating enormous hygienic and environmental problems because they are without adequate basic amenities like water supply, proper flooring, ventilation, lairage, transport, etc. In addition to these, slaughter houses also suffer from very low hygienic standards posing major public health and environmental hazards due to discrete disposal of waste and highly polluted effluent discharge. Unauthorized and illicit slaughtering has also increased manifolds and thus, the related problems, like disposal of waste in hazardous manner, pollution of land, air and water, horrible smell/stench etc., make lives of those living in immediate vicinity and also those living farther away, miserable. Efforts to close the illegal open slaughter houses have, so far, been largely unsuccessful.

The rapidly growing city provides markets for food grains, milk, vegetables, meat etc. So, the city outskirts are day by day becoming a hub of activities. There is a rapid growth of residential areas and other landuses like industrial, commercial, educational institutions, health centers etc. The medium sized cities are also facing similar problems as those faced by mega cities like crowding, congestion, expansion, environmental degradation etc. These problems have become so massive and vital that they have attracted the attention of researchers, planners and local/municipal authorities. Ways have to be found to map out broad strategies to provide livable environment to the dwellers.

Keeping these aspects in mind, in this paper, an attempt has been made to explore the slaughter houses located in the outskirts of Aligarh city and to examine the health and environmental impacts from these slaughter houses. More concern is being expressed over danger to health of residents who live in the vicinity of slaughter houses especially in developing countries where level of awareness is low. People are expressing dissatisfaction with the location of slaughter houses and the way they are being managed. The author has tried to suggest ways for its management.

1.1. Database and Methodology

The study is mainly based on primary sources of data which were collected through survey of the city and its outskirts, neighbouring villages and households living in the vicinity of the slaughter houses. Field surveys were conducted during the years 2011-2012 to collect information from the selected slaughter houses, surrounding villages and households living in these villages. The following methodology has been used:

- 1) Extensive surveys of the city and its outskirts were conducted to locate and map the slaughter houses lying in the outskirts and to collect general information regarding its functioning.
- 2) For indepth investigation slaughter houses located (i) along Anupshahar road and (ii) along Mathura bypass road were selected (**Figure 1** and **Figure 2**).
- 3) Information regarding the environmental and health impacts was collected from sampled households living in the villages in the vicinity of the slaughter houses. Villages were selected randomly on the basis of distance from the slaughter houses *i.e.* 0 to 1.5 km and 1.5 to 3 km. About 30 households from each selected village lying within 0 to 1.5 km distance and 10 households from each selected village lying within 1.5 to 3 km distance from the slaughter house were randomly selected for sampling (**Table 1**). The total sample size consisted of 460 households living in the 26 villages in the vicinity of the slaughter houses (0 to 3 km).
- 4) Information was collected from the 460 households with the help of two sets of structured questionnaire interviews. One set was designed to obtain information regarding the slaughter house *i.e.* ownership, year of establishment, number of animals slaughtered, place from where the raw material came, available facilities for waste disposal and other management issues. The other set was designed for the sampled residents, *i.e.* characteristics of the respondents, effect of slaughter house on their environmental conditions—land, water, and air quality, effect on their health, symptoms associated with abattoir, frequency of diseases etc.

1.2. Discussion and Results

Aligarh (27°53'N latitudes and 78°4'E longitudes) a medium sized city located in the fertile Ganga-Yamuna in-

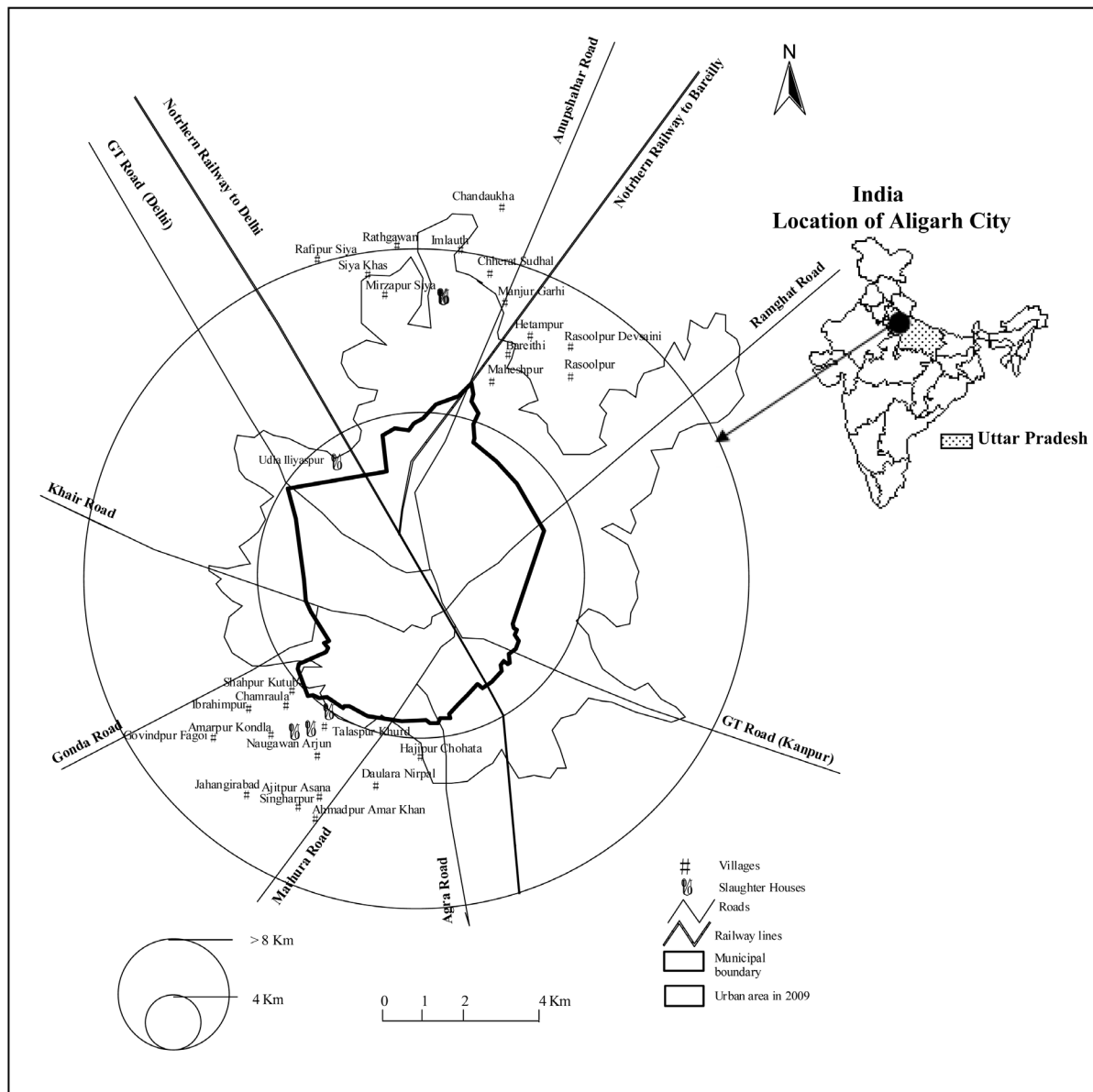


Figure 1. Location of slaughter houses in the outskirts of aligarh city. Source: (i) Singh. A.L. 2011, Urban Sprawl; causes, consequences and policies, B.R. Publishers, New Delhi; (ii) Based on field survey 2011-12.

ter-riverine plain of North India, about 135 kms away from country’s capital New Delhi was selected for the case study. Aligarh, an agricultural and industrial town located in western part of the state of Uttar Pradesh, spreads over an area of about 40 square kilometers and has a population of more than 0.8 million (2011). It has been estimated that by 2021 the city’s population will be more than 1.5 millions [2]-[4]. This will lead to an increase in demand for food items, vegetables, milk, meat etc. Although the city is famous for its lock industries, brasswares and educational institutions but today it has made its name in the country for meat processing and production units (Table 2).

1.3. Location of Slaughter Houses

Field surveys were conducted to locate the *Kattighars* (slaughter house) both inside Aligarh city and its outskirts during 2011 and 2012. Information regarding the functioning of these *kattighars* was also collected.

- **Oldest kattighar at Makdoomnagar**

Table 1. Selection of respondents/households for sampling from villages living in the vicinity of the slaughter houses in the outskirts of Aligarh city.

Distance from the slaughter houses	(i) Slaughter houses located along Anupshahar road		(ii) Slaughter houses located along Mathura bypass road	
	No. of villages living in vicinity	No. of sampled households	No. of villages living in vicinity	No. of sampled households
0 - 1.5 km			1. Talaspur Khurd	30
	1. Chherat Sudhal	30	2. Naugawan Arjun	30
	2. Imlouth	30	3. Saharpur Kutub	30
	3. Manjur Garhi	30	4. Chamraula	30
	4. Mirzapur	30	5. Amarpur Kondla	30
			6. Ibrahimpur	30
Total 0 - 1.5 km	4 villages	120 households	6 villages	180 households
>1.5 - 3 km	1. Hetampur	10	1. Daurla Nirpal	10
	2. Rasoolpur	10	2. Hajipur Chohatta	10
	3. Bareithi	10	3. Ajitpur Asana	10
	4. Maheshpur	10	4. Jahangirabad	10
	5. Rasoolpur dev saini	10	5. Ahmadpur Amar Khan	10
	6. Chandauxha	10	6. Govindpur Fagor	10
	7. Rafipur	10	7. Singharpur	10
	8. Siya Khas	10		
	9. Rathgawan	10		
Total > 1.5 - 3 km	9 villages	90 households	7 villages	70 households
Grand total 0 - 3 km	13 villages	210 households	13 villages	250 households

Source: Based on field Survey 2011-12.

Table 2. Aligarh city's contribution to meat production (2013).

Country/state/city	No. of meat factories and processing units	percentages
1. India	Total number of meat factories	37
	Total number of meat processing units	40
2. Uttar Pradesh	Total number of meat factories	21
	Total number of meat processing units	25
3. Aligarh City	Total number of meat factories and processing units	09
		60
4. Contribution of Uttar Pradesh to India's total meat production of which Aligarh contributes		20 - 24

Source: 1. Based on information collected from field Survey 2011-2012. 2. Amar Ujala, Hindi Daily Newspaper, 16th Sept. 2013.

The *Kattighar* at Makdoomnagar was once located outside the city municipal boundary in the city outskirts along Mathura bypass road. Presently due to growth of city population, the city has expanded and this *Kattighar* is now surrounded by a dense population. People are forced to settle near and around the *Kattighar* having unhealthy conditions. The *Kattighar* at Makdoomnagar is run by the Aligarh Municipality since 1955, the Municipality contracted out the slaughter house to a private contractor who further sub-contracted to 3 butchers who slaughter animals in a private godowns which have no arrangement of drinking water, ventilation and disposal facility. One butcher slaughters about 70 buffaloes per day. At least 2500 buffaloes are slaughtered in these godowns daily and the meat is supplied to the city and various other cities (Khurja, Mathura, Delhi etc.) All the animals to be slaughtered have to undergo health checkup (Uttar Pradesh Nagar Nigam Act., 1955) but no rules are followed here. Now this slaughter house has become old and dilapidated without any basic amenities like water connections, boundary wall, wrotten gate, *kutchha* (uncemented) floor, no solid and liquid waste disposal facility etc. The waste of slaughtered animals is thrown and dumped in the landfill site, some of the waste such as hides and solid waste are sold to private parties while waste water and blood is washed away and discharged

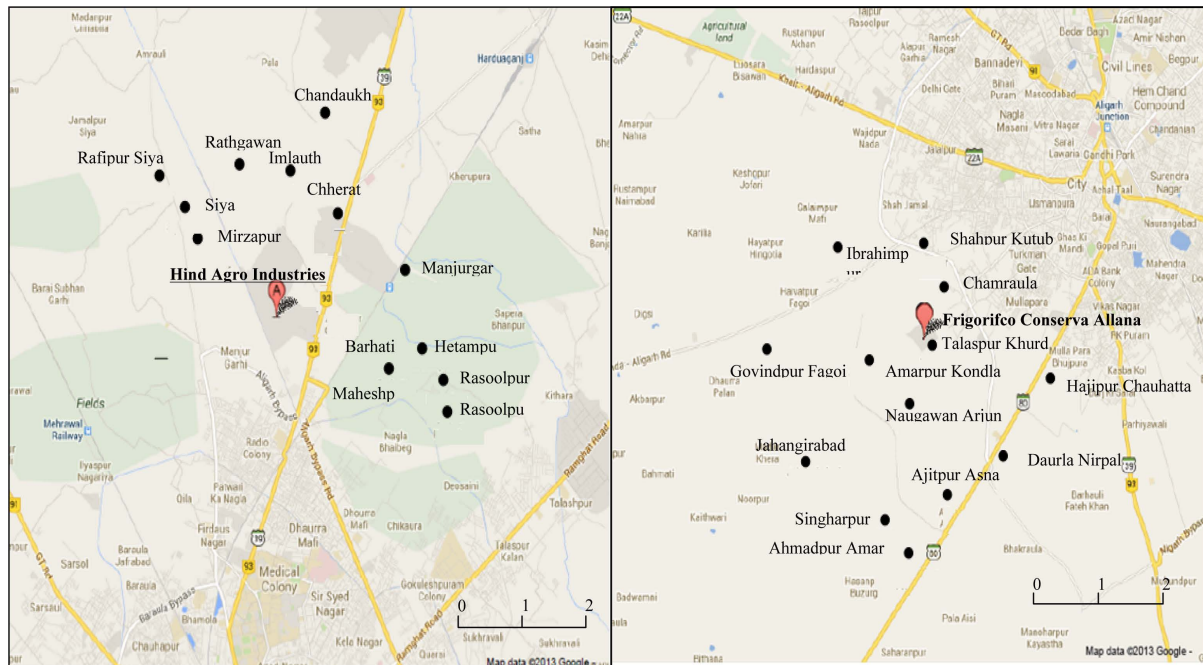


Figure 2. Location of sampled villages in the vicinity of (i) Hind agro industries Ltd (anupshahar Road); (ii) Frigorifco conserva allana (Mathura Road).

in *kutchas* (uncemented drains) around the *Kattighar*. The whole area is *kutchas* and the condition of the place worsens during the rainy season. The area is totally polluted with animal parts strewn all over, having foul-smell and filth all around. Since April, 2012 this *Kattighar* has closed down [5] [6].

- **Illegal slaughtering inside individual households**

Numerous illegal abattoirs are often housed in Aligarh's individual households. Field surveys have revealed that in colonies, such as Sarai Rahman, Shah Jamal, Sarai Sultani, Jamalpur, Tantanpara, Quazi Sarai, Quazipara, Khawaja Chowk, Turkaman gate, Bani Islayn, Khaidora, Bhujpura etc. more than 80 percent of the households slaughter buffaloes. These are two room tenements with a shop in front, where at five in the morning, a buffalo is slaughtered in one of the rooms. All the waste is just washed off into the drain, clogging the sewer lines. Illegal slaughtering in Aligarh cannot be banned [6]. An alternative for this problem was to penalize the *kattighars* which do not improve the conditions of slaughtering and disposal of waste and to give the *kattighars* in the hand of private parties for its proper development.

- **Slaughter houses in the city outskirts**

Privatization of slaughter houses was thought to be a sure panacea for various ills of *kattighars*. In-depth investigation revealed that these slaughter houses were also creating the same problems. The first slaughter house was established in 1992 and gradually 6 meat factories were established in the city outskirts within 7 km from the city centre (Figure 1 and Figure 2, Table 3), 1 along Anupshahar road, 4 along Mathura bypass road and 1 along G.T road (towards New Delhi). These factories have a capacity to slaughter >1000 animal per day. But as per the local reports these factories are slaughtering nearly 25,000 animals daily. Open/illegal slaughtering was rampant and such practices are also creating environmental havoc. Animal parts are seen strewn all over the fields and open places, dogs and vultures could be seen preying over these wretched remains; dirt festering all around; animal blood, water and debris is directly disposed into the drains; there is horrible stench/filth which makes your inwards wrench with revulsion. For in-depth investigation two slaughter houses the Hind Agro Industries (located along Anupshahar road at Chherat village, nearly 7 km away from the city centre) and Frigorifco Conservation Allana Sons Ltd. (located along Mathura by pass road, at Talaspur Khurd, nearly 5 km away from the city centre) were selected (Table 3, Figure 1 and Figure 2).

The Hind Agro, established in 1992 was slaughtering > 12,000 buffaloes daily which were brought from nearby districts (Khurja, Mathura, Meerut, Mujaffarnagar and from Bihar state). Sometimes truck load of animals are illegally brought for slaughtering. Information gathered from nearby villages revealed that waste in

Table 3. Location of slaughter houses in the aligarh city outskirts.

Name of slaughter house	Location		Distance (Km) from the City centre	Year of establishment	Products permitted	No. of animals slaughtered per day	Products transported from/to	
	Road	Village					From Raw Material	To Finished Product
Hind Agro Industries Ltd.	Anupshahar	Chherat	7	1992	Buffalo/sheep and goat Meat	1000 - 12,000	Khurja, Meerut, Muzaffarnagar, Mathura, Agra, Bihar etc.	Egypt, Iran, Saudi Arabia, Malaysia, Finland, South Africa, Sudan, Middle East Countries
Allana Sons Ltd. Allana Centre	Mathura bypass	Talaspur khurd	5	1999	Buffalo Meat	1500	do	do
H.M.A Agro Industries Ltd.	Mathura bypass	Talaspur khurd	5	2010	Buffalo Meat	10000	do	do
Al Tabarak Food as Frozen	Mathura bypass	Talaspur khurd	5	2010	Buffalo Meat	10000	do	do
Al-Dua Food Processing (P) Ltd.	Mathura by pass	Amarpur kondla	5	2011	Buffalo Meat	2000	do	do
Al-Hamd Agro Food Products Pvt.	G.T road (Delhi)	Udla Illyaspur	4	2000	Buffalo Meat	1000	do	do

Note: Many small units of privately owned open slaughter houses are located around Mathura road bypass. Source: Based on information collected from Field survey 2011-2012.

cluding carcass, bones, rumen contents etc. is thrown in open areas/fields or in drains while the animal blood, water is disposed into the Chherat drain which is dirty and clogged and blood is seen flowing in it. When it overflows during the monsoon season, the dirty water spreads into the fields polluting both land and water even killing animals who drink this water. Living and sustaining in the nearby villages has become very difficult for the residents due to stench and filth.

Frigerifico Conservation Allana Sons Ltd. was established in 1999. Two other factories established along Mathura bypass road at Talaspur Khurd village were H.M Agro Industries Ltd (in 2010) and Al Tabrak Food and Frozen (in 2011). In Amarpur Kondla village another factory was established along Mathura bypass road (Al Dua Food Processing Pvt. Ltd (in 2011)). Thus, there were 4 meat factories and processing units and innumerable illegal/open slaughtering butchering over 25,000 animals daily disposing the waste in open fields and blood in open drains *i.e.* in Mathura bypass *nala* (drain).

2. Impact of Slaughter House on the Environment and Health of Residents Living in Its Vicinity

Field investigations have revealed that all the slaughter houses suffer from very low hygienic standards posing both environmental and health hazards due to discrete disposal of waste, highly polluted effluent discharge and burning of bones and hooves etc. Since unauthorized and illicit slaughtering has increased, these problems have also increased manifolds.

Waste generated in the slaughter houses includes both solid (carcass, bones, hooves, rumen, intestine contents, dung etc.) and liquid waste (blood, urine, internal fluids including water used for washing). According to a rough estimate a buffalo weighs about 2 quintals and almost 25 percent of the total body weight becomes waste. It generates 10 litres of waste blood. Surveys of the slaughter houses have revealed that there were no special waste disposal system or treatment plants. The solid waste is either simply thrown and dumped in the open fields or burnt or sold off to private parties. While the liquid waste is washed away and discharged in *nalas* (Chherat drain and Mathura bypass drain) around the slaughtering area. Finally all the water containing blood and debris goes inside the Aligarh drain without treatment. This has led to land degradation, air and water pollution.

The results of survey on characteristics of the respondents (**Table 4(i)**) shows that, 60 percent were males, 50

Table 4. Characteristics and perception/awareness of the respondents living in the vicinity of sampled slaughter houses in the outskirts of Aligarh City.

i. Characteristics					
Characteristics	Percent-ages	Characteristics	Percent-ages	Characteristics	Percent-ages
		2. Age			
1. Sex		Up to 19	5	3. Marital status	
Male	60	20 - 39	50	Married	55
Female	40	40 - 60	35	Unmarried	45
		>60	10		
4. Household Size		5. Educational Status		6. Employment Status	
1 - 2	4	Educated	40	Employed	80
3 - 4	27	Uneducated	60	Unemployed	20
5 - 12	53				
>12	16	8. Length of Stay in the area			
7. Status at home		<5 years	15		
Landlord	37	5 - 10	40		
Tenants	62	11 - 15	35		
Visitors	01	15 - 20	5		
		>20	5		
		ii. Perception and Awareness			
1. Awareness of closeness of slaughter house to residence		2. Contamination of water/ food items by Incidence of flies/ mosquitoes/insects/ in high number spreading infection		3. Horrible stench/odour of slaughter house	
Yes	95	Yes	74	Yes	98
No	05	No	26	No	02
4. Boiling of fat/bones Etc by private parties also spreading bad odour		5. Pungent odour affects breathing and causes respiratory ailments		6. Chocking blocked drains with waste water containing blood and debris spreading infection	
Yes	79	Yes	43	Yes	
No	05	No	14	No	78
Not sure	16	Not sure	43		22
7. Contamination of Surface/ground water		8. Slaughter house is a nuisance			
Yes	58	Yes	74		
No	08	No	26		
Not sure	34				

Source: Based on information collected from Field survey 2011-2012.

percent were between the age of 20 to 39 years, 55 percent were married, 40 percent were educated, 80 percent were employed and the size of household of 53 percent was between 5 to 12. Nearly 37 percent were landlords and nearly 40 percent reported staying in this area for 5 to 10 years. Regarding respondents perception and awareness (**Table 4(ii)**) of slaughter house and its effect on environment and health, 95 percent were fully aware of closeness of slaughter house to their residence. Nearly 74 percent reported of incidence of flies/insects and mosquitoes in high number spreading infection; 98 percent reported of horrible odour from slaughter house; 78 percent reported of choking drains containing water with blood and debris; 58 percent reported of drinking water contamination; 79 percent reported of pungent odour from burning of fats and bones. **Table 5(i)** is showing the

Table 5. Environmental and health impacts reported by respondents (in percentages) living in the selected villages in the vicinity of sampled slaughter houses in the outskirts of Aligarh city (2013).

i. Environmental Impacts								
Distance from the slaughter houses	Name of sampled villages	(i) Slaughter houses located along Anupshahar road			Name of sampled villages	(ii) Slaughter houses located along Mathura bypass road		
		Land degradation	Water Pollution	Air Pollution		Land Degradation	Water Pollution	Air Pollution
0 - 1.5 km	1. Chherat Sudhal	74.67	78.77	83.13	1. Talaspur Khurd	93.33	95.45	98.89
	2. Imlouth	65.00	70.67	73.34	2. Naugawan Arjun	90.11	94.23	96.01
	3. Manjur Garhi	71.33	74.89	78.32	3. Saharpur Kutub	86.67	91.33	95.12
	4. Siya khas	72.67	73.22	75.45	4. Chamraula	78.78	84.89	93.98
					5. Amarpur Kondla	76.65	83.45	92.21
					6. Ibrahimpur	78.90	85.34	94.32
Total	120 households	70.92	74.39	77.56	180 households	84.07	89.12	95.09
>1.5 - 3 km	1. Hetampur	40.00	52.23	56.45		69.90	74.85	
	2. Rasoolpur	45.56	58.88	63.32	1. Daurla Nirpal	67.87	72.65	85.75
	3. Bareithi	43.45	55.56	59.78	2. Hajipur Chohatta	68.79	73.59	81.25
	4. Maheshpur	42.87	55.21	59.65	3. Ajitpur Asana	65.02	66.82	83.34
	5. Rasoolpur dev saini	39.65	49.67	55.34	4. Jahangirabad	64.89	68.73	75.90
	6. Chandaukha	38.89	48.89	53.87	5. Ahmadpur Amar Khan	62.22	65.75	79.45
	7. Mirjapur Siya	37.87	50.90	58.11	6. Govindpur Fagor	60.60	63.21	76.91
	8. Siya Khas	40.02	54.61	58.43	7. Singharpur			74.25
	9. Rathgawan	42.21	57.78	62.54				
Total	90 households	41.17	53.75	58.61	70 households	65.61	69.37	79.55
ii. Health Impacts								
Distance from the slaughter houses	Name of sampled villages	Water borne diseases	Air borne diseases	others	Name of sampled villages	Water borne diseases	Air borne diseases	others
0 - 1.5 km			34.00		1. Talaspur Khurd	74.78	54.34	80.00
	1. Chherat Sudhal	55.95	34.67	78.75	2. Naugawan Arjun	70.49	65.52	83.33
	2. Imlouth	54.62	34.00	65.00	3. Saharpur Kutub	67.81	55.89	90.00
	3. Manjur Garhi	54.26	37.00	68.33	4. Chamraula	74.53	54.12	93.33
	4. Siya khas	52.32		69.45	5. Amarpur Kondla	73.03	57.67	90.00
					6. Ibrahimpur	72.26	54.89	90.00
Total	120 households	54.29	34.95	70.38	180 households	72.15	57.07	87.78
>1.5 - 3 km	1. Hetampur	31.67	16.67	30				
	2. Rasoolpur	23.33	13.33	30	1. Daurla Nirpal	55.00	43.33	80
	3. Bareithi	23.33	20.00	30	2. Hajipur Chohatta	55.00	53.33	60
	4. Maheshpur	40.00	16.67	50	3. Ajitpur Asana	55.00	23.33	70
	5. Rasoolpur dev saini	28.33	16.67	50	4. Jahangirabad	55.00	46.67	50
	6. Chandaukha	21.67	13.33	20	5. Ahmadpur Amar Khan	50.00	26.67	80
	7. Mirjapur Siya	40.00	16.67	50	6. Govindpur Fagoi	55.00	23.33	60
	8. Siya Khas	28.33	13.33	50	7. Singharpur	50.00	46.67	80
	9. Rathgawan	30.00	18.33	50				
Total	90 households	28.33	16.11	40.00	70 households	53.57	37.62	68.57

Source: Based on information collected from Field survey 2011-2012.

environmental impacts as observed and reported by 300 respondents living in the selected villages in its immediate vicinity *i.e.* 0 - 1.5 km and 160 respondents living in the selected villages little farther away *i.e.* 1.51 to 3 km. The results show that land degradation, water and air pollution was higher in close vicinity of the slaughter house and as one goes farther away it decreases.

On the whole, nearly three fourth of the respondents reported that the slaughter house was a nuisance for them because it helped in spreading various infections. The presence of flies, insects in the dumped waste, mosquitoes in choked drains, organisms in the drinking water source, the presence of dirt and pungent smell in the air etc. all these are significant source of health risk. In this study residents living in the vicinity of the slaughter house *i.e.* 0 to 3 km reported of headache, general body ache and weakness, excessive coughing, shortness of breath and other respiratory symptoms, fever, typhoid fever, jaundice, cholera, diarrhoea/dysentery and malaria. Results indicated in **Table 5(ii)** shows that the disease have been grouped under three categories, the water borne, air borne and other diseases. Solid waste and waste water is not a direct threat to health but when accumulates in the neighbourhood it becomes a source of health hazards, when it decomposes it favours breeding of flies, it attracts rodents and vermins; the pathogens present in the waste may be conveyed back to man's food by flies and dust, it is a source of nuisance from smell and unsightly appearance, and drainage from waste dumps pollutes the surface and ground water. The resultant diseases are typhoid and paratyphoid, fever, diarrhoea/dysentery, cholera, hookworm, other intestinal infections etc. Mosquitos population also increases due to open blocked drains causing malaria [7]. A large number of disease vectors live, breed or feed in the neighbourhood of the slaughter houses. Microbial tests carried out on water samples collected from the resident's source of drinking water *i.e.* tube wells indicated presence of organism which are a significant health risk [8]. Not only is the odour/stench from the slaughter house helping in lowering the air quality but the boiling of fat, bones, meat has also helped in spreading the bad odour. Residents from the city and villages reported that with the wind comes pungent odour. The residents reported that they could not spend time outside their home due to odour. They experienced severe headache, body ache, loss of appetite, loss of breath, excessive coughs etc. Data collected with the help of field surveys and presented in **Table 5** shows that: (**Table 5, Figure 3**)

1) The respondents living in closer vicinity *i.e.* 0 to 1.5 km from the slaughter house were suffering more

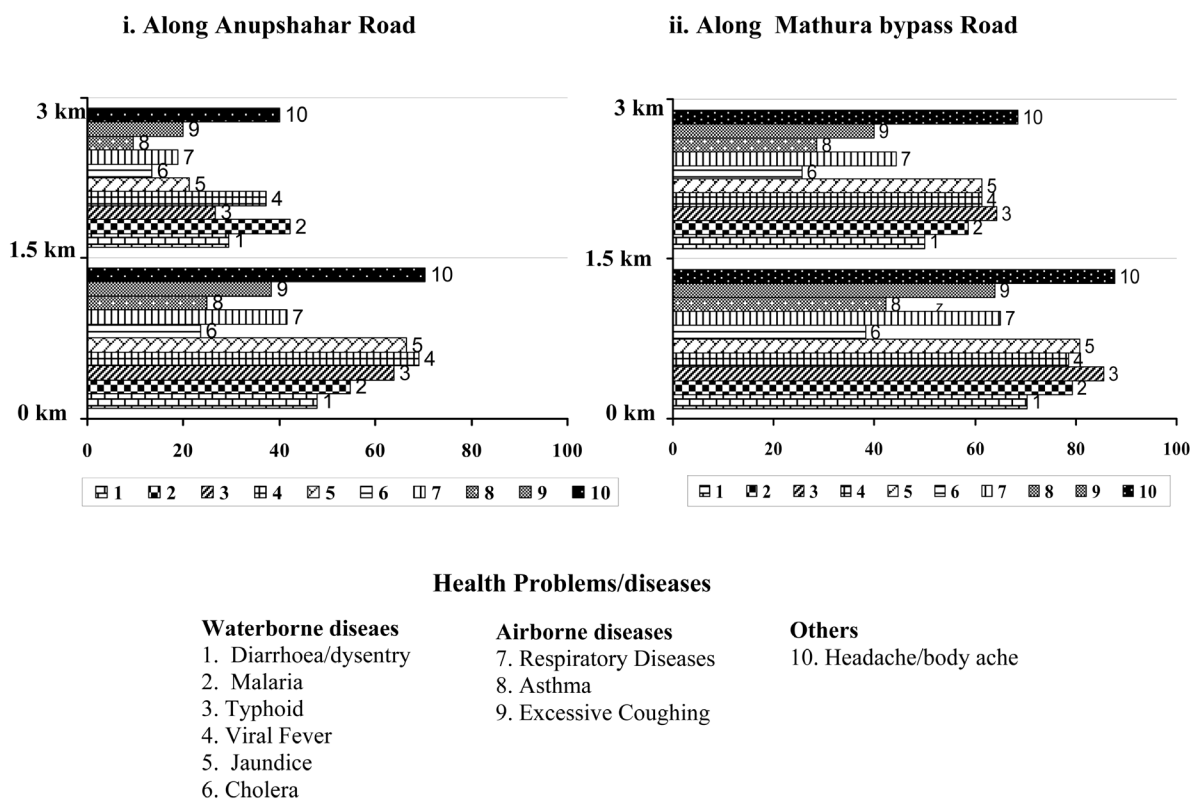


Figure 3. Health Problems and occurrence of diseases reported by respondents (in percentages) living in the vicinity of slaughter houses. (i) Along Anupshahar Road; (ii) Along Mathura bypass Road. Source: Based on field survey 2011-2012.

from both environmental hazards and health problems than those living farther away *i.e.* between 1.5 to 3 km

2) The conditions were worst for residents living in the vicinity of slaughter houses located along Mathura bypass road as compared to residents living in the vicinity of slaughter houses located along Anupshahar road.

3. Conclusions

The foregoing analysis reveals that:

- 1) Slaughter houses were located in the midst of residential areas whether they were inside the city or in the outskirts. The local authorities and municipality should properly chalk out plans for its proper place *i.e.* outside the residential areas so they do not degrade the environment and harm the health of the residents.
- 2) The slaughter house activities and management practices have direct and indirect impact on the land, water and air quality more in its vicinity. The disposal of waste in open fields and drains, the effluent discharge of water with blood and waste in open drains, the disposal of blood borings and burning of solid waste destroy the environmental quality.
- 3) Even today slaughter houses suffer from enormous hygienic and environmental hazards which affect the health of residents living in its vicinity. They reported the occurrence of headache, bodyache, breathiness, nausea/vomiting, coughing and other waterborne and air borne diseases.

4) Conditions were worst for:

- Residents living in the immediate vicinity of the slaughter house and
- For those living in the vicinity of slaughter houses along Mathura bypass road.

So, special attention should be paid by planners, government bodies and local municipal authorities to improve the conditions of these areas.

5) Control and management of slaughter house requires special legislative laws and rules.

- Site location—slaughter houses should be located outside populated areas downwind from the city far away from water body. Landuse policies should be framed accordingly.
- Land contamination—proper storage of waste inside the premises of the slaughter house in an aerated area to minimize biodegradation and pungent/foul smell
- Water contamination—presence of a liquid waste collection system to avoid any water discharges outside the premises
- Air emissions—planting trees around the slaughter houses development of proper aerated storage area to minimize unpleasant smell.

For health, hygiene and safety regular check up of meat handlers, head cover, gloves etc. for them should be carried out. Storing meat in hygienic conditions and provision of all necessary facilities and infrastructure in the slaughter houses should be checked. Above all, the animals brought for slaughtering should be checked by the veterinary surgeon.

The government should enforce the existing laws strictly related to slaughter houses. There should be a proper licensing system for slaughter houses. Public awareness and enlightenment on possible impact of pollution from slaughter house wastes should be embarked upon by government and non-government organizations and public participation is necessary for the development of policies for slaughter house management.

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