

Short Communication

Environmental human faecal contamination in pig raising in Soroti district of Uganda: A short communication

Zirintunda G.^{1,4*}, Fyfe J.², Nsadha Z.³ and Waiswa C.³

¹Department of Animal Production and Management, Faculty of Agriculture and Animal Sciences, Busitema University P. O. Box 203 Soroti, Uganda.

²Division of Pathway Medicine University of Edinburgh Medical School Chancellor's Building, 49 Little France Crescent Edinburgh EH16 4SP.

³College of Veterinary Medicine, Animal Resources and Biosecurity, Makerere University P. O. Box 7062, Kampala.

⁴Department of Animal Health, Ministry of Agriculture, Animal Industry and Fisheries P. O. Box 102 Entebbe, Uganda.

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Environmental faecal contamination is the defecation on the ground or failure to dispose faeces into the latrine; it could be because of lack of latrines or even a deliberate shunning of latrines. This contamination is a worldwide problem that is perhaps exacerbating parasitic neglected tropical diseases (NTDs). The vice enables the lifecycle of parasitic zoonoses like taeniasis which is associated with neuro-cysticercosis (NCC) in the pig raising communities where primitive methods of free ranging are used. This cross-sectional study was made to assess the estimated human faecal density as an indicator of poor sanitation and latrine coverage in Soroti district of Uganda. Approximated transects of varying areas were made in which global positioning system (GPS) coordinates of faecal heaps along walk ways were recorded. Latrines and faeces that were observed in the selected homesteads of the approximated transects were also recorded. Faeces were seen around houses and latrines; the latrine coverage was 46% which is far below 90% required to achieve good sanitation; however observing large faecal heaps near latrines indicated possible deliberate shunning of latrines even where latrines were available. Some faeces possibly end up in the water sources if not eaten by the scavenging pigs making the communities vulnerable to many diseases. If latrine coverage is not campaigned with a per capita approach and applied just as latrine per homestead then it still remains ineffective against poor sanitation. In places where primitive habits of eluding latrines are still practiced; just having a good latrine coverage is not enough to guarantee good sanitation. There is need for a realistic sensitization and demystification about all faeces.

Key words: Faeces, Latrine, pig

INTRODUCTION

Environmental human faecal contamination is thought to be a result of deliberate or desperation of not using latrines, this may be due to negligence or taboos obstructing particular people from using latrines. Faecal

environmental contamination is a worldwide problem in both rural and urban areas which causes public inconveniences and illnesses (McLaughlin et al., 2007). Faecal contamination of the environment can also be as

a result of flow of latrine/toilet sludge during flooding seasons and when latrines are erected in wetlands. Poor sanitation in swine keeping areas is associated with porcine cysticercosis (Gonzalez et al., 2005). Environmental faecal contamination predisposes the human population to the consumption of *T. solium* eggs in food and water. The infected individuals become carriers and sources of infection by oral-faecal contamination (Antoninks et al., 1999). Poor sanitary conditions such as deficiency of latrines and raising pigs by free ranging methods increase the prevalence of swine cysticercosis. Flowing of sewerage sludge from leaking latrine/toilets are some of the factors that increase swine chances of accessing human faeces. Pigs are not provided with any feeds or are fed on scanty rations and then left to fend for themselves through scavenging. The frequency in which pigs were seen consuming human faeces was slightly different among age groups; it also depended on hierarchical order with the most dominant taking more faeces than the rest (Gonzalez et al., 2005).

The methods of pig keeping in Soroti were not clearly known; however, in case of any human faeces along road sides and in bushes surrounding homesteads roaming pigs could inevitably eat it. The unknown levels of environmental faecal contamination in conjunction with swine roaming might be escalating into taeniasis which is bound to significantly affect the productivity and grade of life of the members of the community by predisposing them to neurocysticercosis (NCC), epilepsy, hepatitis and psychiatric complications. The enterococci which are passed out in faeces are opportunistic pathogens which are responsible for millions of human and animal infections annually (Mululeedhara et al., 2012).

Soroti district is between latitudes (1°15N and 2°00N) and longitudes (33°00E and 33°45E). Soroti district headquarters are at 01°46N, 33°39E (Latitude: 01°7711 and Longitude: 33°6555). The district has a total surface area of 2262.6 km² and a land area of 2256.5 km² with 70500 households with a population of 367600 (UBOS, 2006). Despite various efforts by NGOs and government to sensitize about having latrines, many people have not listened or the communication has been misunderstood. The influx of North Eastern sometimes overwhelms the sanitation facilities in Soroti district. Environmental sanitation is one of the millennium development goals (MDG) and environmental faecal contamination can spread not only taeniasis but a multitude of other water borne infections.

Latrine use

With increase in human population, treatment and

disposal of human waste is increasing, since human faeces are the main source of diarrheal infections (Quinlan and James, 2009). Making latrines is a simple technology that can be used to control diarrhoea and related cases, but latrine coverage has to reach 90% of a population to have an impact on the community health (McConville, 2003). Some people do not respond to latrine construction and use because of what they call high costs of construction, lack of space and the difficulties of maintaining (McConville, 2003). In many places, children's faeces are considered harmless and therefore not disposed in latrines.

MATERIALS AND METHODS

A cross-sectional study was done in 2011 to determine the extent of environmental faecal density in the various selected areas by counting and mapping of faecal matter deposits and latrines in selected areas. This was done along paths or any roads and in some homesteads in the selected areas. Though the mapping of faeces along the paths and roads was continuous in the approximated transects; the visiting of homesteads for mapping latrines and faeces was discontinuous. A homestead after every five was selected in urban areas, while only two homesteads were skipped in rural areas because rural areas were more sparsely populated. The coordinates of the faeces and latrines were read from a universal transverse Mercator- global positioning system (UTM-GPS) device after reaching them physically and examining for the case of latrines.

RESULTS

A total of 83 homesteads were sampled in 25 approximated transects that were assumed in the various parts of Soroti district. The coordinates of faeces and latrines in the various selected areas of the study area are summarized as shown in Table 1.

Faeces were found in the homesteads even near latrines; however, the general latrine coverage was 46% (Table 2 and Figure 1), and lack of latrines was more common with rural homesteads. There were unknown reasons for not disposing children's faeces in the latrine. Many households were usually clustered in a single homestead and sharing a single latrine; however, the demography was not captured. most contaminated with human faeces.

DISCUSSION

Areas had varying results possibly because of different people of various lifestyles regarding latrine use and general sanitation. Commensurate latrines or the people were not interested in latrine use. Areas in peri-urban

*Corresponding author. E-mail: ggerald777@gmail.com.

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Table 1. Coordinates of the faeces, latrines in the selected areas.

Transect No.	Start coordinates	Ended coordinates	Faeces coordinates	Latrines coordinates	Village/Parish/Subcounty
1	36N0569415/0199237	36N0569499/019987	36N0569462/0199325 36N0569480/0199879	36N0569422/0199257 36N0569467/0199372 36N0569467/0199613 36N0569552/0199891	Omadera/Aloet/Arapai
2	36N0569084/0198793	36N0569498/0198139	36N0569352/0198287	36N0569003/0198741	Arapai/Arapai/Arapai
3	360570808/0198188	36N0570849/0198717	36N0570849/0198209	36N0570759/0198213 36N0570865/0198661	Aloet /Aloet/Arapai
4	36N0568219/0188336	36N0568342/0187772	36N0568329/0187770	36N0568303/0188257 36N0568218/0188338 36N0568209/0188150 36N0568189/0188124 36N0568058/0188085	Pamba/Pamba/WD
5	36N0568622/0187731	36N0568436/0187017	36N0568578/0187704 36N0568747/0187118	36N0568587/0187697 36N0568503/0187553 36N0568556/0187367 36N0568715/0187131	Opiyai A/Ameni/Soroti
6	36N0573942/0196833	36N0574856/0196543	36N0574678/0196721	-	Angaro/Dokolo/Gweri
7	36N0574852/0196568	36N0574699/0195393	-	36N0574748/0195968 36N0574724/0195460 36N0574697/0195339	Angaro/Dokolo/Gweri
8	36N0574282/0195870	36N0574117/0195991	-	36N0574092/0195944	Angaro/Dokolo/Gweri
9	36N0566570/0181011	36N0566940/0181064	-	36N0566696/0181011	Asuret/Mukura/Asuret
10	36N0566594/0180867	36N0567438/0180839	-	36N0566594/0180867 36N0567490/0180908	Asuret/Mukura/Asuret
11	36N0567404/0180678	36N0566524/0180690	36N0567404/0180678	36N0567462/0180671 36N0566524/0180688	Asuret/Mukura/Asuret

Table 1. Cont'd.

12	36N0566532/0190636	36N0565809/0191721	36N0566035/0191418	36N0566034/0191398 36N0566817/0191719	Asuret/Mukura/Asuret
13	36N0570109/0190041	36N0570156/0190046	-	36N0570109/0190042 36N0570156/0190046 36N0570114/0190042	Kichinjaji/Kichanjaji/ND
14	36N0570359/0197906	36N0570371/0197228	36N0570356/0197908 36N0570313/0197695 36N0570295/0197597	36N0570290/0197596 36N0570344/0197420 36N0570367/0197446	Aloet/Aloet/Arapai
15	36N0570369/0197228	36N0568842/0193396	36N0568693/0193345	36N0568524/0193221 36N0568530/0193225 36N0568597/0193349 36N0568705/0193368	Asinge/Madera/ND
16	36N0571870/0200588	36N0572024/0200873	-	36N0572024/0200577 36N0571800/0200590	Akaikai/Dakabela/Arapai
17	36N0573810/0200586	36N0573392/0198722	36N0573407/0198869	36N0573304/0198814 36N0573407/0198869 36N0573489/0198746 36N0573495/0198796	Abia/Awaliwali/Gweri
18	36N0573597/0199045	36N0574868/0199655	-	-	Amoroto/Awaliwali/Gweri
19	36N0574874/0199659	36N0575009/0200566	-	36N0574842/0200166	Amoroto/Awaliwali/Gweri
20	36N0572910/0198772	36N0573065/0198798	-	36N0572898/0198793	Abia/Awaliwali/Gweri
21	36N0570117/0189980	36N0560130/0203077	-	-	Odamasiko/Ojumu/Katine
22	36N0562774/0206388	36N0562568/0206836	-	36N0562773/0206386 36N0562663/0206619	Ogwolo/Olwelai/Katine
23	36N0561837/0210188	36N0560871/0211941	-	36N0561837/0210188	Anyalai A/Palaet/Tubur

Table 1. Cont'd

24	36N0562040/0209544	36N0562038/0209546	-	-	-
				36N0560543/0212458	
				36N0567832/0188804	
25	36N0567832/0188804	36N0567750/0189489	-	36N0567910/0188832	Sq/CW/Eastern Division.
				36N0567668/0189243	
				36N0567750/0189489	

WD: Western division, ND: northern division, Sq: senior quarters, CW: central ward.

and urban areas they had latrines, but there was faecal littering possibly because on latrine per capita basis, the latrines were not enough.

Latrine coverage

The observed latrine coverage of 46% (Table 2 and Figure 1) was very low and indicates that there were many people defecating on the open grounds, yet some latrines still lacked walls and roofs and could only be used at night. For good sanitation, latrine coverage should reach the minimum of 90% (McConville, 2003). However, for effective sanitation, latrine coverage per se still remains implausible unless per capita latrine coverage is considered because of the varying population densities. Although the urban and peri-urban areas had more latrines per square kilometer, they were not proportional to the population densities and this could have led to faecal littering. In some cases latrines existed but people opted to defecate not in the latrine but around, because of unknown reasons possibly because of negative myths or the rooms were too small for some people to fit in. Therefore, even with recommended latrine coverage, it is possible for scavenging pigs to be vulnerable to cysticercosis.

Disposal of children's faeces into latrines

Across Uganda many cultures discourage throwing children's faeces into the latrine and instead just throw in bushes or dump on dust bins if any attempts to dispose are made at all. The findings made us to presuppose a tendency to assume children's faeces not as unsafe as for adults and this makes faeces to enter the food or water cycle. Hepatitis A and amoebiasis is said to be spread by fecal contamination of food or water (Cuthbert, 2001; Fiore, 2004); no wonder the diseases are prevalent in Soroti district, although the levels are not known. Most children's faeces and other undisposed faeces are possibly eaten by scavenging swine or could end up in the community water bodies (McQuaig et al., 2006; Fawell and Nieuwenhuijsen, 2003). Environmental fecal littering can lead to contamination of even underground water sources with human enteric viruses (Gibson et al., 2011; Touron et al., 2007; Sinton et al., 1998; Ottoson and Stenstrom, 2003). More study is needed to estimate the prevalence of all diseases related to sanitation in Soroti district.

Faecal density

In the rural Soroti, the households were traditionally

crowded in one homestead having distant neighborhoods with insufficient or zero latrine facilities (Table 2). The sparse distribution of the human population in the rural areas makes people too lax to construct latrines. Markets places have underestimated the requirement for the latrine facilities and their charges are perceived as expensive while others have no latrine facility at all. Travelers are accustomed to stopping on the roadsides for helping themselves and no public toilets have been constructed on the roadsides with resultant faeces littered all over the environment. Other factors identified as major reasons for human faecal littering include the rampant alcoholism as drunkards are usually careless or incapable of reaching the latrines; also upcoming kindergarten school facilities in the villages without Latrines.

The general latrine coverage was far lower than that required to control disease and therefore the communities are either having subclinical diseases or are at risk of the various diseases of poor sanitation that just having latrines per se can affect sanitation or the prevalence of porcine cysticercosis unless the habit of latrine use is adopted. There is still deliberate ignoring of latrines by adults and not disposing children's faeces into latrines. A holistic sensitization is needed not only in Soroti but in most communities

Table 2. Selected homesteads and status of having or lacking latrines.

Transect No.	Homestead No.	Have Latrine?
1	1	Yes
	2	Yes
	3	No
	4	Yes
2	1	No
	2	No
	3	No
	4	Yes
3	1	Yes
	2	Yes
	3	No
	4	No
4	1	Yes
	2	Yes
	3	Yes
	4	No
5	1	Yes
	2	No
	3	Yes
	4	Yes
	5	No
	6	Yes
6	1	No
	1	No
	2	No
	3	Yes
7	1	No
	2	No
	3	Yes
	4	Yes
8	1	No
	2	Yes
9	1	Yes
	2	No
	3	No
10	1	No
	2	Yes
	3	No
	4	No
11	1	Yes
	2	Yes
	3	Yes
12	1	Yes
	2	Yes

Table 2. Cont'd.

13	1	No
	2	Yes
14	1	No
	2	No
	3	No
	4	Yes
	5	No
15	1	Yes
	2	Yes
	3	No
	4	No
16	1	No
	2	No
17	1	Yes
	2	Yes
	3	Yes
	4	Yes
18	1	No
	2	No
	3	No
	4	No
19	1	No
	2	Yes
	3	Yes
20	1	Yes
	2	No
	3	No
21	1	No
	2	No
	3	No
	4	No
22	1	Yes
	2	No
	3	Yes
23	1	No
	2	No
	3	No
	4	Yes
24	1	No
	2	No
25	1	Yes

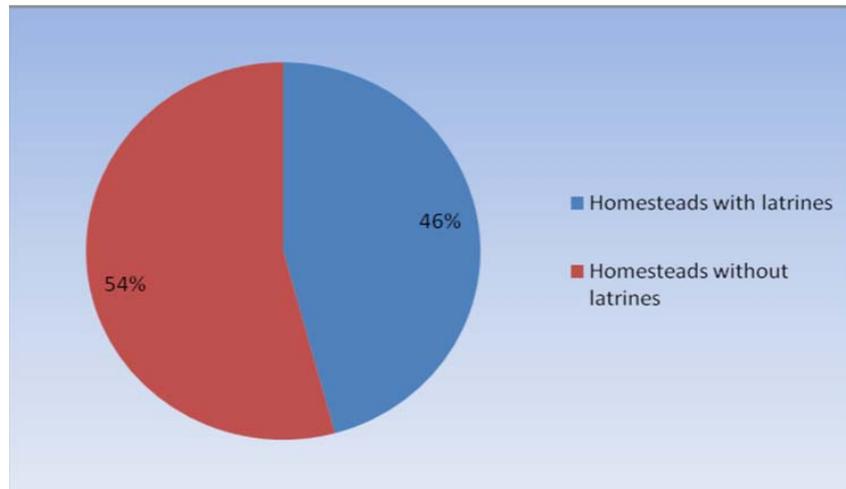


Figure 1. Observed latrine coverage in Soroti district.

of Uganda about sanitation; otherwise the masses are at a great risk of preventable diseases. Poor sanitation exacerbates parasitic zoonoses where swine and ruminants are intermediate hosts.

Conflict of Interest

The authors have no conflicts of interest to declare.

Abbreviations

NCC, Neuro-cysticercosis; **NGO**, Non-governmental organization; **MDGs**, millennium development goal; **NTD**, neglected tropical diseases; **UTM**, universal transverse mercator; **GPS**, global positioning system; **Km²**, Square kilometer.

REFERENCES

- Antoninks S (1999). Epidemiology of neurocysticercosis. *Rev. Neurol.* 29(4):331-4.
- Gonzalez AE, López-Urbina T, Tsang BY, Gavidia CM, Garcia HH, Silva ME, Ramos DD, Manzanedo R, Sánchez-Hidalgo L, Gilman RH, Tsang VC (2005). Short report: secondary transmission in porcine cysticercosis: description and their potential implications for control sustainability. *Am. J. Trop. Med. Hyg.* 73(3):501-503.
- Cuthbert AJ (2001). Hepatitis A: Old and New. *Clin. Microbiol. Rev.* 14(1):38-58.
- Fawell J, Nieuwenhuijsen M (2003). Contaminants in drinking water. *Br. Med. Bull.* 68:199-208.
- Fiore EA (2004). Hepatitis A Transmitted by Food. *CDC, Clinical Infectious diseases* 38:705-15.
- Gibson EK, Opryszko MC, Schissler JT, Guo Y, Schwab KJ (2011). Evaluation of Human Enteric Viruses in Surface Water & Drinking Water Resources in Southern Ghana. *Am. J. Trop. Med. Hyg.* 84:(1)20-29
- McConville J (2003). How to promote the use of Latrines in developing countries. Michigan Technological University. Cited on 13/3/2014, available from www.cee.mtu.edu/peacecorps
- McLaughlin LA, Kaarela O, Keinanen TMM, Munster U, Tuhkanen T, Puhakka J, Meschke JS (2007). Evaluation of a method to Identify sources of fecal contamination for urban watershed management in Western Finland Using 16S rDNA gene fragments as a genetic marker. International symposium on New Directions in Urban Water Management, (12th -13th September).
- Mululeedhara NB, Meredith BN, Asja K, Zachery RS, Valerie JH (2012). Enterococci in the Environment. *Microbiol. Mol. Biol. Rev.* 76:(4)685-706.
- Ottoson J, Stenstrom TA (2003). Faecal contamination of grey water and associated microbial risks. *Water Research* 37(3):645-655
- Quinlan CW, James R (2009). An approach to Recover Hydrocarbons from currently off-limit Areas of the Antrim formation, MI using Low-Impact Technologies, a final report. Available from http://www.geo.mtu.edu/svl/LINGO/reports/42931R05_Final.pdf Accessed 15/4/2014
- Sinton LW, Finlay RK, Hannah DJ (1998). Distinguishing human from animal faecal contamination in water: A review. *New Zealand J. Marine Fresh water Research* 32(2).
- McQuaig SM, Scott TM, Harwood VJ, Farrah SR, Lukasik JO (2006). Detection of Human derived Fecal Pollution in Environmental waters by use of a PCR-based Human Polyomavirus Assay. *Appl. Environ. Microbiol.* 72 (12) 7567-7574.
- Touron A, Berthe T, Gargala G, Fournier M, Ratajczak M, Servais P and Petit F (2007). Assessment of faecal contamination and the relationship between pathogens and faecal bacterial indicators in an estuarine environment (Seine, France). *Marine Pollut. Bull.* 54(9):1441-1450
- Uganda Bureau of Statistics (2006). 'Uganda Population and Housing Census'. A Report. Kampala, Uganda: UBoS.