

## Personal toilet after defaecation and the degree of hand contamination according to different methods used

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### Summary

Transmission due to contaminated hands is one of the important routes by which diarrhoea pathogens spread. The hands commonly become contaminated while cleaning the anus after defaecation. This study deals with the commonly used methods of anal cleansing in a low socioeconomic community in Rangoon, Burma and with the degree of hand contamination that results according to the method used.

A cross-sectional survey was employed for collection of behavioural and hand contamination data. The incidence of acute diarrhoea and dysentery among under-fives in this community was monitored for 1 month and was correlated with the cleaning method used by their mothers.

Water was the principal method used for cleaning the anus in all age groups. No one used toilet paper and only 4 to 9% used paper other than toilet paper. The level of education seemed to be a factor in determining the use of paper or water. The hands of mothers using water were more contaminated than those using paper. However, thorough hand washing with soap and water was found to be effective in decontaminating the hands. Furthermore, there was a relation between the incidence of diarrhoea and dysentery and the method of cleaning.

### Introduction

Most of the pathogenic organisms responsible for diarrhoea are transmitted primarily by the

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faecal-oral route (Feachem 1984). A variety of pathways are possible for these pathogenic organisms, passed in the faeces, to reach the mouths of susceptible persons. Whether the pathway is through water, food, or by direct spread, hands or fingers play an essential role in conveying pathogens from the source to the susceptible person. Faecal contamination of hands usually occurs during defaecation and it is probably influenced by the methods used in cleaning the anus. Thus, it will be useful to know the common anal cleaning methods in the community and the degree of hand contamination that can occur with the different methods used. The present study reports the different methods of anal cleansing after defaecation in families residing in a low socioeconomic community in Rangoon, the degree of hand contamination before and after defaecation in mothers with children aged under-five in this community and the association of diarrhoea and dysentery with the cleaning methods.

### Materials and methods

#### STUDY COMMUNITY

The study was carried out during May and June, 1985 in Nga-Ka ward, one of the 39 wards that comprise the Thin-Gun-Kyun township in Rangoon. The township, which covers 11.4 km<sup>2</sup>, lies on the north-eastern side of Rangoon. It is about 10 km away from the heart of the city and its economic activities include government factories, privately owned industries and farming. It has a population of 193 973 living in some 20 572 households. The Nga-Ka ward, which lies in the eastern part of the township, has a population of 9559 and is

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subdivided into 15 electoral units (EUs). The majority of people in this ward have low incomes, and live in overcrowded sub-standard houses. Most of them use insanitary pit or surface latrines. The principal water source is from a number of privately owned tube wells.

#### STUDY POPULATION

The study population included all 386 people resident in the No. 6 EU of Nga-Ka ward. This particular EU was selected for study because it fairly represented the socioeconomic and environmental health conditions that prevail in the ward and also because the people of the EU were expected to be co-operative and helpful throughout the study.

#### STUDY DESIGN

The study had cross-sectional and prospective components. In the cross-sectional component, methods of cleaning the anus after defaecation among family members residing in EU 6 were determined using a questionnaire. Subsequently, the degree of hand contamination, according to the different methods used, was determined in a random small sample of eight mothers with children under 5 years of age. In the prospective component, all the under-five children residing in the study community were followed for 1 month (June) to monitor for the development of acute diarrhoea or dysentery.

#### METHODS

The method of cleaning the anus after defaecation was ascertained by six trained interviewers who made house to house visits with a pre-tested questionnaire. To determine the degree of hand contamination, three hand swab samples were collected from each of the eight mothers, one just before defaecation, one immediately after defaecation and one after washing hands with soap and water, on each of 2 consecutive days. Swabs were collected using the modified method of Khin-Mar-Nwe (1982). Briefly, the swab was removed from the sterile wrapping and was inserted into the tube containing sterile peptone water. After soaking it with peptone water, it was pressed against the tube to remove the excess solution so that it would be moist but not wet. It was then rubbed

onto the dorsum and ventral surfaces, webs and skin creases of both hands in a systematic manner: four strokes on each portion of the surface. Two swabs were used, one for each hand. They were then replaced into peptone water tubes, and their terminal ends were broken off under sterile conditions. The tubes were then capped, sealed and stored in ice and transported to the Department of Medical Research by car within 2 to 3 h of collection. The specimens were processed immediately in the laboratory to determine the faecal coliform (FC) count using the multiple tube method as described by the International Commission on Microbiological Specification for Foods (ICMSF) (1968). Faecal contamination of hands was judged indirectly by the presence of *Escherichia coli* (faecal coliform) which are the indicators of faecal contamination (Black *et al.* 1982; Ekanem *et al.* 1983; WHO 1983).

The hands were decontaminated by washing with soap and water using the modified method of Mackintosh and Hoffman (1984). Briefly, hands were wetted under cool running water (stored washing water in households, poured from a bathing bowl) and soaped with plain bar soap for 5 s, lathered for 5 s and then rinsed until free of lather. Water was allowed to drip from the hands but they were not dried or allowed to touch anything. The hand swab was then taken with the hands still moist.

Daily surveillance for acute diarrhoea and dysentery was done by a trained community health worker from the Nga-Ka ward. The operational definitions of acute diarrhoea and dysentery used were as described by Newell (1965) and Woodruff & Bell (1978) respectively.

## Results

#### METHODS OF CLEANING THE ANUS

Table 1 describes the distribution of different methods of cleaning the anus after defaecation in the study population by age. In this community, water was the principal method used (77%) for anal cleaning after defaecation in all age groups as well as in the specific age groups. None used toilet paper and only 9% used paper other than toilet paper.

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Table 2. Methods of cleaning (percentage frequencies)

#### Cleaning method

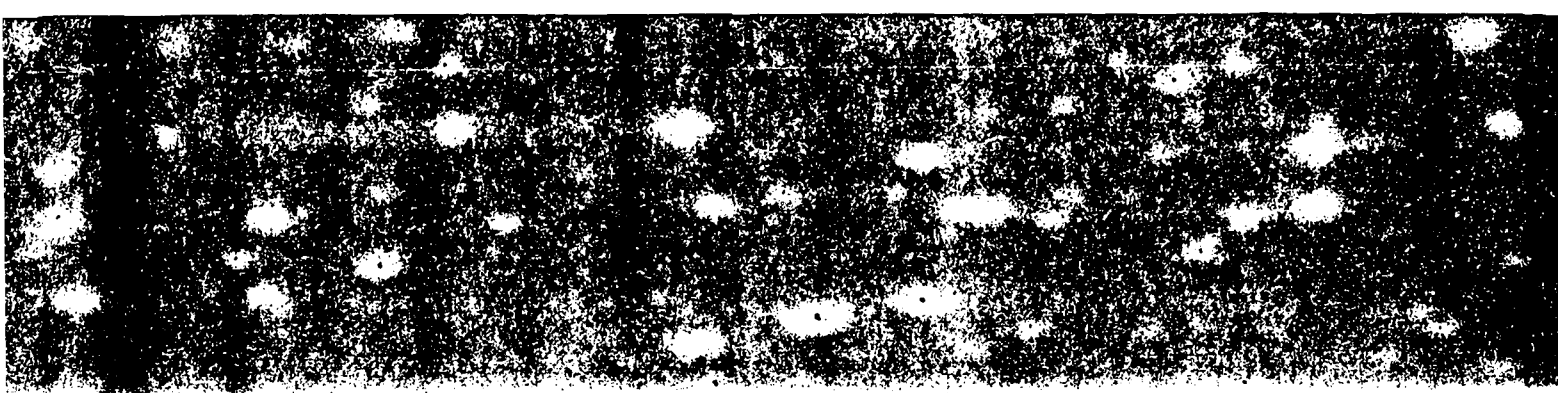
Water  
Toilet paper  
Other paper\*  
Water & other paper\*  
Other†

\*Paper other than toilet  
†Includes, diapers, stick

In this community, paper plus water education becomes, decreased from 91% to 77% in those with primary education and down to 50% in school or college education. It is true for the use of paper, increased from 0% to 32% (Table 2).

#### DEGREE OF HAND CONTAMINATION

The degree of hand contamination after defaecation using different methods is shown in Table 3. In all age groups, water was used for cleaning after defaecation. Water used were more than 70% in all age groups. Using paper, even though the difference was even, it was higher for the hand



**Table 1.** Methods of cleaning the anus after defaecation in the study population, by age, Thin-Gun-Kyun, 1985 (percentage frequencies)

Cleaning method	Age			Total (n=386)
	0-4 (n=48)	5-14 (n=87)	>14 (n=251)	
Water	92	77	75	77
Toilet paper	0	0	0	0
Other paper*	4	9	10	9
Water and other paper*	0	14	15	13
Others†	4	0	0	1

\*Paper other than toilet paper.

†Includes, diapers, sticks etc.

**Table 2.** Methods of cleaning the anus after defaecation in the study population by education, Thin-Gun-Kyun, 1985 (percentage frequencies)

Cleaning method	No formal education (n=79)	Some or completed primary/secondary school education (n=252)	Some or completed high sch/college education (n=40)	Total (n=371)
Toilet paper	0	0	0	0
Other paper*	5	9	18	9
Water & other paper*	0	14	32	13
Others†	2	1	0	1

\*Paper other than toilet paper.

†Includes, diapers, sticks etc.

In this community, the use of paper alone or paper plus water increased as the level of education becomes higher. However, water use decreased from 91% among the illiterates to 77% in those with primary or secondary school education and down to 50% in those with high school or college education. The reverse was true for the use of paper/paper plus water which increased from 0 and 5% to 9 and 14% to 18 and 32% (Table 2).

#### DEGREE OF HAND CONTAMINATION

The degree of hand contamination according to different methods of cleaning the anus before/after defaecation and after hand washing is shown in Table 3. The hands of mothers who used water were more contaminated than those using paper, even before defaecation. This difference was even more marked after defaecation, for the hands of water users were found

to be contaminated more frequently (as judged from the number of colony forming units (cfu) of FCs isolated) than the paper users in whom the cfu of FC remained more or less the same as that before defaecation. However, after thoroughly washing the hands with soap and water, FC isolation was significantly reduced (the increase in some hand swabs of the paper-using group is probably due to the use of contaminated water).

#### DIARRHOEA/DYSENTERY RATE AND CLEANING METHOD

The association of incidence of diarrhoea and dysentery among the children aged under 5 years and the method of anal cleaning after defaecation in their mothers is given in Table 4. There is some indication of an association between the incidence and the method of cleaning. The incidence was lowest in those children

**Table 3.** The degree of hand contamination according to different methods of anal cleaning before/after defaecation and after hand washing, Thin-Gun-Kyun, 1985

Cleaning method	Mothers	Faecal coliforms (colony forming units)		
		Before defaecation	After defaecation	After hand washing
Water	1	0	0	0
		0	93	43
	2	3	240	15
		460	150	0
3		nd	$1.1 \times 10^7$	0
		23	1100	4
4		0	23	0
		$1.5 \times 10^4$	460	9
Other paper*	1	0	0	0
		0	0	0
	2	15	0	0
		0	0	0
	3	0	15	23
		0	0	4
	4	0	0	0
		0	0	0

\*Paper other than toilet paper.  
nd Not done.

**Table 4.** Incidence of diarrhoea and dysentery among under 5 year olds by the method of anal cleaning in mothers, Thin-Gun-Kyun, 1985

Cleaning method	Diarrhoea			Dysentery		
	Cases	Child-days	Incidence rate*	Cases	Child-days	Incidence rate*
Water	19	906	2.1	5	906	0.5
Water & other paper†	3	147	2.0	0	147	0.0
Other paper†	1	180	0.5	0	180	0.0

\*Cases per 100 child-days.

†Paper other than toilet paper.

whose mothers used paper and the reverse was true for those who used water. The risk to water users was 3.8 times that of paper users but the relative risk was not statistically significant ( $0.2 > P > 0.1$ ;  $Z = 1.3916$ ).

### Discussion

The principal method of cleaning the anus after defaecation in this community was by water in all age groups. However, the type of cleaning

method used will depend on the habits and customs of the family, which in turn are influenced by those environmental conditions which favour the use of a particular method (such as cheap and readily available water favouring the use of water) and also by education, income and the availability of materials to be used in the cleaning.

The finding that the use of paper alone or paper plus water increased and that that of water decreased as the level of education

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became higher may be because educated persons are more aware of the dangers of water use or of the supposed hygienic benefits of using paper. However, it may also be that educated people are more well off financially and are thus able to afford books, magazines, newspaper, etc, in their homes which can be used as a source of cleaning paper.

High FC counts found in some hand swabs of water users before defaecation indicate that the hands of these persons are more likely to be contaminated through hand-faeces contact during defaecation or through handling of contaminated materials in the household environment. In this context, it is apparent how easily the contaminated hands can transfer pathogens to susceptible persons, either directly or indirectly through food, water and other objects. We have shown that hands can readily become contaminated after defaecation, especially when water is used for cleaning the anus. However, thorough washing with soap and water can decontaminate them and therefore health education on hand washing with soap and water after defaecation and before food handling should be given to all those persons using water for cleaning. Furthermore, education may stress the use of paper rather than water for anal cleaning, particularly for those who cannot or do not wish to use soap for washing hands after defaecation.

Although not statistically significant, because of small numbers in the paper-using group, there seems to be some indication of an association between the incidence of diarrhoea and dysentery in the under-fives and the use of water for anal cleaning after defaecation in their mothers. Further studies with adequate sample sizes controlled for education and economic level should be performed to test the hypothesis.

These findings indicate the importance of hand washing after defaecation and before food

handling or eating and of the use of paper in cleaning the anus after defaecation because of the reduced faeces-finger contact.

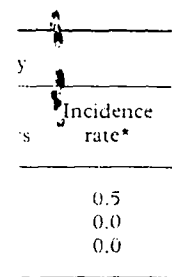
### Acknowledgements

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