Original article

# Hygienic behaviour and environmental conditions in Jimma Town, South-western Ethiopia

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**Abstract**: A cross-sectional survey was conducted in April 1997 to determine hygienic behaviour and practices among the inhabitants of Jimma Town, South-western Ethiopia. From the three Weredas of Jimma Town, a systematic sampling technique was employed to select a total of 278 households for the study. Of these 123 households were selected on the basis of set criterion for more in-depth observation on their hygienic behaviour. The result shows that 53.2% of the respondents own houses while the rest live in a rented house or live with other people. It was found that within the household, people complain of vermin. Specific complaints show that, 77.8% complain of rats, 67.5% of fleas, 56.5% of mosquitos, 50.2% of flies, and 42.4% of bedbugs. The majority of respondents (97.8%) believe in the importance of latrines, and a substantial number of them (71.9%) have got latrines. However, it was observed that, of those who have got latrines, 21.5% were found to be either unsanitary or partially non-functional. Observation data has shown that even those who get it from safe source get it contaminated in the house.

As concerns energy use, it was found out that most people use unprocessed energy source such as wood (96.3%), charcoal (54.4%), leaves (33.8), and dung-cake (11.8%) in the household.

The result in general shows that the hygienic and sanitary practices and behaviours are unhealthy, based on standard hygiene and sanitary parameters. Most parameters have positive correlation with income and education, which may take some time to change so that a concerted effort needs to be made to educate the public on personal and group hygiene and sanitation. [*Ethiop. J. Health Dev.* 1999;13(2):77-86]

## Introduction

Environmental health is a science which is interested in the relations between people and the physical, social and cultural environment. Such relations entail positive or negative health behaviour and practices. To this effect, it is believed that understanding of behaviour of the people within social and cultural context is very important. Behaviour, according to Boot and Cairencross, is the way people act in general, especially to the situation they are in, or, the people they are with. On the other hand, hygiene means healthy practice of making oneself and ones' surrounding clean, especially with regard to prevent illness or the spread of disease(1).

Behaviour, which is culture bound, is practices of hygiene and sanitation. This, on the other hand plays a remarkable role in the cause and transmission of diseases, especially of those that are related to environmental domains (1). Among the five environmental domains, water plays an important part because it is with a reliable and easily accessible water source that a satisfactory personal, domestic, and food hygiene is possible (2). A study made to see the relationship between personal and domestic hygiene and hospitalized children with diarrhoea showed that overall

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cleanliness and kitchen hygiene were significantly associated with diarrhoeal disease (3,4). According to UNICEF, under-five children die in millions mainly due to unsanitary living conditions and unhygienic practices of water or food handling (5, 6).

Human behaviours associated with hygiene are manyfold, including safe disposal of human excreta, the use of more water for personal cleanliness, domestic food preparation, and hand washing are among the most important measures in preventing the transmission of major infectious diseases. Baltazar (1993), pointed out that provision of improved water supply and sanitation reduced the incidence of diarrhoea among young children by 20-27%. However, a

combination of these with good personal hygiene practice was shown to promote reduction by 40%(2). After reviewing many studies, Cairncross (1991) and others came to the conclusion that health benefits come from changes in hygienic behaviour (1, 4, 7).

Rahman et al. (1985) confirmed the importance of fecal contamination of the living environment in increasing morbidity and mortality rates. He further indicated that in households without a latrine and where feces are left deposited in the yard, or house, infant mortality was 2.76 times higher than in households where latrine was used (8). Clemens, and Han et. al. (1987) also reported that defecation in the open by young children in the family living area was associated with high incidence of childhood diarrhoea (9, 10). Muler et al. (1989) studied to find out whether it is high standard latrine or hygienic practices that is important in reducing the incidence of excreta-related diseases, taking ascaris as an indicator. They found out that hygienic practice is much more important because the high standard latrine floor that is kept dirty and the soil where defecation in the open is practised was found to show high count of ascaris eggs (11).

It was also found out that supplying clean water to people without adequate change of behaviour towards good hygienic use of it will not change the incidence of diseases related to water. Water could be contaminated during collection, storage in open vessels, and/or in vessels that are not washed regularly. Using communal cups and immersing dirty hands when drawing water also contaminate the water. These are some of the practices that are related to behavioural patterns that contribute to the contamination of a perfectly treated water (3, 12, 13, 14).

Khan (1982), Han et al (1990), Clemens et al (1987), Feachem (1984), Kaltenthaler (1988), and Pinfold et al (1988) mentioned in their studies that hands become readily contaminated after defecation. As a result, all have arrived at a similar conclusion that hand washing using soap and plenty of water after defecation, before eating or touching any cooking and eating utensils proved to be effective in reducing the incidence of diarrhoeal morbidity and mortality (9,10,15,16,17,18). Wilson et al (1991) have similarly documented that using plenty of water is also important to reduce conjunctivitis in adults and children (19). This however, is believed to be influenced by both the availability of water and the hygienic use of it.

Several studies have thus shown that, despite the availability of sanitary latrines and proper water supply, people often fail to use them properly. This may be because of low socio-economic standard or educational level which influence the level of sanitation and appreciation hygiene behaviour. Feachem (1984), after reviewing various studies conducted in developing countries, stated that a complex of poverty (socio-economic), ignorance, illiteracy and crowding (density), associated with behaviour, promote the transmission of enteric pathogens (16). The specific behaviours that have received attention with regard to their role in promoting the transmission of enteric pathogens are water handling, food handling and hand washing behaviours (1). Consequently, it is still relevant to study hygienic behaviour and practice in order to formulate prevention and control measures (20,21).

In this study, attempt was made to identify the hygienic behaviour and practices of selected households in Jimma Town. This study focused on assessment of the sanitary conditions and hygienic practices of the inhabitants. The out-come of the study will be used to draw relevant recommendation for appropriate intervention. Furthermore, the study intends to make available information that will serve as baseline for subsequent specific studies. **Methods**

*Study site*: Jimma is one of the major towns in Ethiopia. It is located 335 kms southwest of Addis Ababa. The town has an average altitude of 1760 metres above sea level with a mean minimum and maximum temperatures of 11 and 27 degree Centigrade, respectively. Jimma has an average annual rainfall of 1489 mms. According to the 1994 census, the total population of the town was estimated to be 88,867 (23). Jimma Town, like many other Ethiopian towns, has overcrowded (high density) and sparsely populated (low density) areas. Lack of space for latrine construction, poor sanitation conditions, and over crowdedness have led to poor environmental health conditions, especially in the high population density areas.

*Data collection and analysis*: Preliminary information on the boundaries and administrative arrangement of the three Weredas and the 20 Kebeles in Jimma Town was gathered. Since the Kebeles were found to be further organized into Zones, all the Zones in all Kebeles were registered. From the registration list, and with the assistance of the respective Kebele leadership, high and low density areas were selected from the three Weredas once high and low density areas were identified 50% of the higher and equal number of Kebeles from high and low density areas were purposefully selected. Following this, study subjects were selected by systematic sampling from the list of households under circumstances where the selected household is missed, abandoned or demolished, it was replaced by a house number

to the left of the missed house. In order to undertake further behavioural and hygienic practice studies, households with children below the age of five were selected.

Data collection was effected by data enumerators or observers. The enumerators were trained so that they understand the objective and the terminologies used for the study. They were also taken to a Kebele which was not selected for the study for a hand-on practice drill on the introductory approach, administering the questionnaire, and inspecting facilities such as latrines. The questionnaire was designed to generate such pertinent informations as housing conditions, demographic characteristics, water supply, and excreta disposal. Pretesting was done by administering it in the field to eliminate vagueness and promote clarity. The interview was administered to the head of the household or to the wife when available even if it took repeated visits.

Observation checklists were employed in order to collect data on people's hygienic practice at household level. The observed households were selected after the questionnaire survey was finished. Households with under-five children were picked and organized by Kebele and zone. Observers were selected from the enumerators and were further trained on the objectives and art of observation. They were taken to households for field practice so that they learn how to introduce themselves, explain the objectives, and on how and what to observe. Observation was made in households with children under five years of age for one hour (7.00 A.M. to 8.00 AM) every morning for a period of one week. The target for the observation was the house mother who is usually involved in household chores, such as feeding, washing, cooking, and cleaning in the mornings. The time was selected because it is assumed that, among other times, it is early in the morning that many household activities and hygienic practices are performed.

The method used for observation was spot checking whereby the observer records specific hygiene-related practices or physical characteristics of interest at the first moment of observation in the house or compound. The observer notes the relevant activity of all individuals and especially the house mother at a given time. This has the advantage of observing the real situation where the people observed are not disturbed for long time by the presence of the observer (12).
In both observation and survey, data were collected using Oromiffa, which is a widely spoken local language, whenever necessary, but Amharic was also used.

*Measurements*: Housing condition is assessed through observation to be poor or crowded based on the size of the house and number of people and animals living in a house. A house is considered unsanitary if it has a floor area of less than 6.5 square meters, a window area of less than 10% of the floor area, and with no separate kitchen and sleeping area. In order to assess conditions of indoor air pollution, type of energy sources used such as cowdung, wood, and kerosene were inquired.

Water supply is analyzed to be safe or unsafe based on from where it is fetched. Water collected from unprotected spring, well, and river are considered unsafe. Daily consumption is determined using the capacity of the vessel they use for transporting water and multiplying it by the number of times they fetch water during one day. Safety was also assessed in the homes that is whether water is stored in clean and covered container, water drawing practices, and others.

Waste (human excreta or solid waste) situation was inquired and observed. It is not only the availability of the facilities but their proper and frequent use was assessed.

Interview and inspection was conducted to see if arthropods and rats are felt problems in the households. Sensitive senior informations were neither asked or observed.

Income and education of the head of the households were inquired to see their relationship with behaviour or hygienic practices. Data was checked for clarity and completeness, and was returned back to the enumerators for revising if found doubtful or unclear.

*Data Processing*: The SPSS/PC was used for storage and retrieval of data for cross tabulation and analysis. Chisquare test was employed to test associations between variables. Data from observation was manually analyzed.

*Study subjects*: A total of 278 houses were selected for the survey. From the total 278 houses surveyed 123 households, with children below five years of age were selected for in depth observation on how mothers are reacting to the cleanliness problems created by children.

## Results

*Characteristics of the study subjects*: The major ethnic groups in the study area were Oromo (42.4%) followed by Amhara (23.7%), and Dawro (13.3%) while the remaining are

Table 1: **General information on the study population of Jimma Town, southwestern Ethiopia, September 1996.**

| Sources of data | Number | % |
|---|---|---|
| Kef. 1 | 89 | 33.0 |
| Kef. 2 | 80 | 28.8 |
| Kef. 3 | 109 | 39.2 |
| Total | 278 | |
| Housing Ownership (n=278) | | |
| Owned | 148 | 53/2 |
| Rented | 130 | 46.8 |
| Average Monthly income in Birr (n=272) | | |
| <150 | 169 | 62.1 |
| 150-300 | 58 | 23.5 |
| 301-500 | 34 | 12.5 |
| 105-1000 | 7 | 2.6 |
| >1000 | 4 | 1.5 |
| Educational status of HH (n=278) | | |
| Illiterate | 76 | 27.3 |
| 1-6 completed | 98 | 35.3 |
| 7-12 | 75 | 27.0 |
| >12$^{th}$ | 8 | 2.9 |
| Others | 21 | 7.5 |
| Ethnicity (n=278) | | |
| Oromo | 118 | 42.4 |
| Amhara | 66 | 23.7 |
| Dawro | 37 | 13.3 |
| Keffa | 25 | 9.0 |
| Gurage | 19 | 6.8 |
| Others | 13 | 4.8 |
| Water Source (n=278) | | |
| Safe | 162 | 58.3 |
| Unsafe | 116 | 41.7 |
| Do you own toilet (n=278) | | |
| Yes | 200 | 71.9 |
| No | 78 | 28.1 |
| Does it function (n=278) | | |
| Yes | 157 | 56.5 |
| No | 121 | 43.4 |
| Problem of rodents (n=278) | | |
| Yes | 242 | 87.1 |
| No | 36 | 12.9 |
| No. of liters per family. Per day (n=278) | | |
| 1-10 liter | 28 | 10.1 |
| 11-0 “ | 96 | 34.5 |
| 21-30 “ | 76 | 27.3 |
| Above | 78 | 28.1 |

Table 2: **Water drawing practices from home storage, by educational level Jimma Town, September 1996.**

| Educational level | Water drawing practices | | | | n=278 |
|---|---|---|---|---|---|
| | Pour | Use ladle | Dipping | Use all | |

| | No. | % | No. | % | No. | % | No. | % | Total |
|---|---|---|---|---|---|---|---|---|---|
| Illiterate | 22 | 29.7 | 6 | 6.6 | 47 | 51.6 | 11 | 12.1 | 91 |
| Elementary | 25 | 24.3 | 10 | 9.7 | 56 | 54.3 | 12 | 11.6 | 103 |
| High school and above | 30 | 35.7 | 15 | 17.8 | 37 | 44.1 | 2 | 2.4 | 84 |
| Total | 82 | 29.5 | 31 | 11.2 | 140 | 50.4 | 25 | 8.9 | 278 |

Kulo, Yem, Tigrai and Gurage. Most of the households (62.1%) have a monthly income of less than 150 Birr 33.8% have income of 151-500 Birr, and 4.1% have more than 500 Birr. Physical state of housing revealed to be poor and crowded with, on average, five and more people living together. Those with tertiary level education (above grade 12) account for only 2.8% while 27.3% are illiterate, and 62.3% do have either elementary or secondary level education. The remaining 7.6% are those who had taken literacy classes and who can sign their names and read with difficulty and those who are literate in reading Koran (Table 1).

*Water supply*: The type of water being used by people includes from both safe and unsafe sources. Fifty eight percent of the households claimed to use protected sources while the rest use unprotected water, such as from wells, springs, and river water. Out of those who get safe water, 23.4% have yard tap or inside plumbing, while the rest have to walk 5-10 minutes to fetch water. In the study, 33.4% of the study subjects were found to store water

either in barrel or clay pots which are largely uncovered while the large majority (66.6) get their water directly from taps, or bring only small quantity several times a day. Transfer of water out of the storage was carried out by dipping (50.4%), pouring (29.5%), using laddle (11.2%) and all methods (8.9%) (Table 2). The other hazard is where the container used to fetch water from storage is left after use. It was found that 9.0% hang it on walls near the storage container, 6.8%, leave it inside the storage container, 5.8% put it on the storage cover and the rest (78.4%), do not have specific place or care where they put the container (Table 3). From information gathered through observation, it was fond out that how people fetch water does not show any difference despite variation in educational status. Daily water consumption per capita was calculated to be 4.6 liter. Nevertheless, the amount of litter consumed in a day vary remarkably (Table 1).

Over 55% of the study subjects were found to use more than 20 liters of water per capita per day. The majority of these (87.5%) were

Table 3: **Placement practices, by educational level, of water drawing utensils after use in households in Jimma Town South-Western Ethiopia, September 1996.**

| Educational level | Placement practices | | | | |
|---|---|---|---|---|---|
| | hang on Wall | put on cover | leave it inside | others | Total |
| Illiterate | 15(16.5) | 9(9.9) | 7(7.7) | 60(65.9) | 91 |
| Elementary | 5(4.8) | 4(3.9) | 2(1.9) | 92(89.3) | 103 |
| High School | 5(6.6) | 3(3.9) | 7(9.2) | 61(80.3 | 76 |
| 12+ | = | = | 3(37.5) | 5(62.5) | 8 |
| Total | 25(9.0) | 16(5.8) | 19(6.8) | 218(78.4) | 278(100) |

Table 4: **Evaluation of the sanitary condition of the observed households Jimma Town, using selected variables. September 1996.**

| | S.No Variables | Satisfactory | | Unsatisfactory | |
|---|---|---|---|---|---|
| | | No. | % | No. | % |
| | **Housing n=123** | | | | |
| 1 | House floor con. Material | 38 | 30.9 | 85 | 69.1 |
| 2 | windows available | 85 | 69.1 | 38 | 30.9 |
| 3 | window area (n=85) | 3 | 3.5 | 82 | 96.5 |
| 4 | floor area | 40 | 32.5 | 83 | 67.5 |
| 5 | bedroom cleanliness | 51 | 41.5 | 72 | 58.5 |

| | | | | | |
|---|---|---|---|---|---|
| | **Kitchen n=123** | | | | |
| 1 | Separate kitchen | 71 | 57.7 | 52 | No kitchen |
| 2 | kitchen with chimney(n=71) | 9 | 12.7 | 62 | 87.3 |
| 3 | kitchen with improved stove | 11 | 15.5 | 60 | 84.5 |
| | **Latrine n=123** | | | | |
| 1 | latrine available | 68 | 53.3 | 55 | No latrine |
| 2 | free from fly larvae (n=68) | 23 | 33.8 | 45 | 66.2 |
| 3 | floor cleanliness | 34 | 50.0 | 34 | 50.0 |
| | **Compound hygiene n=123** | | | | |
| 1 | Private compound | 84 | 68.3 | 39 | 31.7 |
| 2 | well drained (n=84) | 60 | 71.4 | 24 | 28.6 |
| 3 | refuse/garbage in the compound | 33 | 39.3 | 51 | 60.7 |
| 4 | excreta in the compound | 60 | 71.4 | 24 | 28.6 |
| | **Personal hygiene N=123** | | | | |
| 1 | Hand and nails clean | 59 | 47.9 | 64 | 52.1 |
| 2 | Cloth clean | 61 | 49.6 | 62 | 50.4 |

* water supply storage, and drawing practice was observed in all households under study.

** carrying water from a distance area by itself was not rated unsatisfactory.

found to have tertiary level education. Concerning water safety, only 1% of the literate (elementary and secondary level education) and illiterate population claim to boil water for safety reason as against 2.9% of the tertiary level educated ones.

*Housing*: The majority of the study population (53.2%), live in their own houses while the rest (46.8%) live in rented houses (Tables 1,5). Among those who own houses, 43.9% have cattle, 3.4% have horses, and 9.5 have sheep and goats while those who live in rented houses have few of the mentioned animals.

Among those who own animals, 80% live together with mainly cows, sheep, and goats inside the living quarter while 10.6% tie them on the veranda, and 9.4% in the Kitchen. It was found out that 69.1% of the houses have windows, but out of those who have windows, 96.5% have window areas of less than 10% of the floor area, which implies poor ventilation. Besides, it was observed that floor area is also very small as compared to the number of people living in the house. Fifty eight percent of the bed rooms were found to be unhygienic; refuse was found to be poorly managed in 60.7%, and excreta was observed in 28.6% of the compounds surveyed (Table 4).

Kitchen availability was indicated in 71 of the observed 123 houses (57.7%). The sanitary quality of the kitchens was such that 87.3% have no chimney and 84.5% use traditional floor level stoves (Table 4).

*Excreta Disposal*: Although the majority of the respondents (97.8%) believe in the importance of having sanitary facilities only 71.9% have the facilities (Table 1). The most common type (93.7%) was found to be pit latrine. VIP and water carriage toilets were 3.3% and 3.0%, respectively (Table 6). From the total available sanitary facilities observed during the survey, 21.5% were found to be unsanitary. Also among the observed 123

Table 5: **No of houses owned and rented by income groups, in Jimma Town, south-western Ethiopia, September 1996.**

| Average monthly income in Birr*** | Ownership of housing | | n=278 |
|---|---|---|---|
| | Own | Rent | Total |
| Less than 150 | 97(57.4)* | 72(42.6) | 169(60.8) |
| 151-300 | 26(44.8) | 32(55.2) | 58(20.9) |

| | | | |
|---|---|---|---|
| 301-500 | 20(57.1) | 15(42.9) | 35(12.6) |
| Above 500 | 5(31.1) | 11(68.7) | 16(50.7) |
| Total | 148(53.2) | 130(46.8) | 278(100) |

* Number in brackets are percentages. Those individual households who live with others are included with rent groups in their respective income category

** Income of head of the household

houses with under-five children, 68, or 55.3% have the sanitary facility, out of which 66.2% were full of fly larvae, and 50.0% were dirty. (Table 4). Among those households which do not own any sanitary facility, 9% defecate inside their compound, 2.6% outside their compound, and 56.4% away from their house in the bush, while the rest either use public latrines or share neighbour's latrines. Observation data complements this result whereby it was found out that refuse and excreta are disposed in the compound in 60.7% and 28.6% of the cases, respectively (Table 4).

*Personal hygiene*: Upon observation of house mothers personal hygiene and hygiene practice, it was found out that 52.1% of the

Table 6: **Number and type of human waste disposal facilities available in households in Jimma Town, south-western Ethiopia, September 1996.**

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| | Type of latrine | | | n=200(71.9%) |
|---|---|---|---|---|
| Housing Status | WC | VIP | Pit. latrine | Total |
| Owned | 3(2.1) | 4(3.50) | 106(93.7) | 113(56.5) |
| Rented | 3(3.6) | 3(3.6) | 18(93.2) | 87(43.5) |
| Other | | | | |
| Total | 6(3.0) | 7(3.3) | 187(93.7) | 200(100) |

Key: WC = water closet (flush) VIP=Ventilated Improved Latrine

* Those sharing neighbours pit and those using public latrines are include under pit latrines

hands and nails and 50.4% of their clothings were not clean (Table 4).

*Arthropods and Rodents*: The presence of rodents, fleas, and other arthropods was identified as a common problem by the residents of Jimma Town. Out of the 278 households surveyed, 58.9% complained about vermins and rodents. Complaints were due to rats (77.3%), fleas (67.5%), mosquitoes (56.5%), flies (50.2%), and bed-bugs (42.4%). As depicted in Table 7, the problem is very common among all income groups.

*Energy use*: It was found out that households use mixed biomass fuel (wood, charcoal, leaves, cow-dung) in the homes. As shown in Table 8 most households (96.7%) use

Table 7: **Identified arthropod and rat problems, by households and income group Jimma Town, south-western Ethiopia, September 1996.**

| | Types of identified pests | | | | |
|---|---|---|---|---|---|
| Income | Fleas | Flies | Mosquitoes | Bedbug | Rat |
| Range(Birr) | No % | No % | No % | No % | No % |
| <150 | 131(77.9) | 94(55.9) | 104(38.4) | 90(33.2) | 140(83.3) |
| 151-300 | 37(63.8) | 26(44.8) | 32(55.2) | 14(24.1) | 41(70.7) |
| 301-500 | 13(38.2) | 13(38.2) | 14(41.2) | 9(26.5) | 23(67.6) |
| >500 | 2(18.2) | 3(27.3) | 3(27.3) | 2(18.2) | 7(63.6) |
| Total | 183(67.5) | 136(50.2) | 153(56.5) | 115(42.4) | 211(77.8) |

Note: * Percentage is calculated from the number of respondents in that income group except the total where N= 271.

* Respondents have indicated more than one pest problem

Table 8: **Energy use, by average monthly income, Jimma Town Southwestern Ethiopia, September 1996.**

| Income Range | Wood | Dung Cake | Leaves | Charcoal | Kerosene | Electricity |
|---|---|---|---|---|---|---|
| <150 | 161 | 20 | 65 | 75 | 9 | 6(n=168) |
| 150-300 | 57 | 6 | 20 | 37 | 6 | 7(n=58) |
| 301-500 | 33 | 6 | 7 | 28 | 12 | 7(n=34) |
| >500 | 11 | | | 8 | 4 | 5(n=11) |
| Total | 262 (96.7)* | 32 (11.8) | 92 (33.9) | 148 (54.6) | 31 (11.4) | 25 271 (9.2) |

NB * Numbers in brackets are percentages. People use more than one type of energy source

wood, followed by charcoal 54.6%, and twigs and leaves 33.9%. Processed fuel, such as kerosene, is used by (11.4%), while pollutant free energy, such as electricity, is used by only 9.2% (Table 8).

**Discussion**

As clearly depicted by the different studies, there is close relationship between hygiene, attitudes, and hygienic practices which are culture bound. In this study it was found out that those with less income and low educational status tend to live in crowded areas and have poor sanitary status. This can be seen by the prevalence of rodents, amount of water used in the household, ownership of latrine, and management of water in the household.

Ownership of private houses was not associated with income or educational level. In the study, it was found that those with low income were found to have their own houses (Tables 1 and 5). This may be explained by the fact that many of those with better income are government employees who came on assignment and whose turnover rate is higher than those settled owning their own house. This however, is not meant to show that all government employees do not own houses.

Low income members, especially those who own houses, were found to subsidize their income by raising domestic animals, such as cows, goats or sheep ($p<0.05$). It was found out that living with animals in the same living quarter was the outcome of lack of extra room or space for animals and fear of theft.

The amount of water used in a household was found to correlate or show positive relations between educational level and per capita water consumption at household level ($p<0.05$). How water is drawn from a barrel or clay pot and where the drawing material is kept showed the fact that people's concept of hygiene is low. One of the important parameters in keeping water safe is to either use it directly from the tap or have a sanitary storage facility. Many studies have shown that water was found to be contaminated during transport and storage, even if it was from a treated and safe supply (2, 6).

The study clearly shows that people's practice of good sanitation is far from satisfactory. Some important sanitation facilities, such as excreta disposal, are not sufficiently available. Even if it exists, most are found to be unsanitary and are more of health hazards. Often, educated members of the study population and those with relatively better income have latrine ($p<0.05$). However, it was found out that the cleanliness of the compound does not have any difference on the basis of educational status of owners.

The personal hygiene status of the observed housemothers who are responsible for food preparation and child rearing was also found to be poor. In other studies, such conditions have been found to be significantly associated with incidence of diarrhoea (3, 5).

**Recommendations**

In general, from findings of both observation and survey, the immediate environment, that is the house and the compound in most cases, are not sanitary when evaluated from the view point of ventilation crowding, availability of kitchen and its hygiene condition, vector and arthropod.

Most of the sanitary violations correlate with income or education, which will take a long time to change. A short cut to develop awareness and changing of behaviour could only be possible by information, education, and communication (IEC) programs at Kebele and Zonal level. Therefore, the following recommendations are in order:

- Carrying out a systematic study on hygiene behaviour, conducted over a longer period of time.
- Health education, mass mobilization, and motivation toward improvement of environmental sanitation in a neighbourhood should be the logical program of health facilities in the area.

**Operational definitions**

*Water supply*: For water supply to be rated satisfactory,

1. the source must be protected with cement in the cases of springs; built with cement with a hand pump installed in it in the case of wells; processed following water treatment procedures in the case of surface water.
2. houses with inside plumbing or, at least, yard taps
3. drawing out water from storage must be free from any contact by hand (example is pouring than dipping)

*Excreta Disposal*: For an excreta disposal to be rated as satisfactory,

1. it must be free from flies, fly larvae and smell
2. the floor must be clean
3. it must have superstructure with a door for privacy and free from accident hazards for children and adults.

*Housing*: For a house to be rated satisfactory,

1. it must be sited in a well drained area.

2. the house must have enough floor area (>6.5 square meter/person)

3. it must have natural and artificial light and ventilation provided with a window whose area must be at least 10% of the floor area.

4. the house must have separate arrangements for sleeping, dining and living.

5. there must be a separate kitchen away from the living area or a kitchen with efficient chimney to prevent smoke from entering the living area if the kitchen is located inside the house.

6. domestic animals should not be accommodated in the same house; they should be put at least 7.5 meters away from the living area.

7. the house must be free from nuisance or disease producing arthropods and rats.

8. general housekeeping (arrangement of furniture, cleanliness of floor, bedding, etc) must be orderly.

*Compound hygiene*: for a compound to be rated satisfactory,

1. it should be well drained with not impounded water.

2. it must be free from any accident hazard, refuse or garbage, human or animal waste.

*Solid waste*: For a solid waste disposal to be rated satisfactory,

1. waste must be removed once a day and disposed in a controlled tipping within the compound.

2. solid waste must be stored in a receptacle with cover if there is a municipal collection programme.

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