

ORIGINAL ARTICLE

Hygiene practices and awareness regarding Milk borne diseases (MBD) among dairy workers in unorganized urban settings of Bhubaneswar, Odisha, India

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Abstract

Background: Dairy work is thought to be predominantly a rural occupation. However, due to preferences we see a lot of urban residents consume fresh milk and hence, few people even in the urban areas take up cattle rearing as a cost effective profession. In the midst of much talked re-emerging diseases, caused by close habitation of animals and man, it would be very relevant to see living conditions of these populations and their hygiene practices in a space compromised scenario. In urban settings, they stay in close proximity and due to socioeconomic conditions, dairy workers do not have appropriate amenities to tend on the cattle, clean or even scope for proper waste disposal. This in nutshell, leads to a disease enabling environment and the study aims at reviewing these living conditions. Besides, an assessment of health conditions of the dairy workers, their awareness regarding the milk borne diseases (MBD) was done. The findings helped generate recommendations for improvement of the profession and ultimately the quality of the milk. **Objectives:** 1) Assess the hygiene practices during the stages of milk collection, storage and transport of milk among the sampled dairy workers from urban unorganized settings of Bhubaneswar. 2) Assess awareness of these workers regarding milk borne diseases. **Methodology:** This cross-sectional survey was part of a larger study and was conducted in unorganized sector of dairy workers in Bhubaneswar. 60 dairy households were surveyed and from each household, 2 members actively involved in dairy work were selected. The study tool was a semi structured, mixed questionnaire. The questionnaire had 3 sections; A was regarding household information (General sociodemographic details and Housing conditions for 60 HHs); B was to elicit the hygiene status of dairy workers (n=120) during each step of their work, their milk handling details during milk collection, storage and transportation; C had questions to assess the awareness of dairy worker regarding MBD. **Results:** Hygiene practices were very dismal at all points like milking, storage and transportation. Only 5.0% dairy households practised cleaning udder twice- prior to and after milking. Only 35% households kept the milk storage containers covered. 44.2% workers agreed that "MBD" is a community health problem. On general examination, pallor and icterus was found among workers. This strongly brings out that this group not only have the potential to be infected by zoonotic diseases, but can also transmit it to through the milk they are selling. A felt need is assessed for these workers in terms of creating standards of hygiene practices of cattle and milk handling and also impart them training on improving their occupational practices.

Keywords

Dairy household; Dairy worker; Hygiene; Milk borne disease

Introduction

Dairy farming is an important source of income for 70 million rural households in India that produce an

estimated 139 million tons of milk annually. In states like Odisha, mixed crop and livestock farming is the most predominant farming system for maximum households(1). Dairy workers from the urban

unorganized sector were defined operationally as "Dairy workers that care for cows that supply milk and oversee the harvesting of their milk, residing in urban slums without being associated to any profession union or dairy organization" (2). As new and often small dairy industries are materializing around the world, an understanding of their needs and challenges is crucial. The knowledge regarding animal husbandry (defined as "production and care of domestic animals"), milk safety, hygiene and environmental responsibility to healthy actions are compromised owing to cultural, geographic and economic constraints of these workers.

Milk is an example of ideal culture medium and acts as ready made vehicle for harboring, favouring and enhancing foodborne pathogens, namely *S. aureus*(3,4,6), *Strept. Species*(7), *E.coli*(4,8), *Bacillus*(7), in milk causing serious health risk on consumption, broadly termed as "**Milk-borne diseases**"(9).

Negligence of the poorly oriented dairy workers towards this public health problem holds a major concern. This study was conceived to assess dairy workers in urban areas, who are usually migrants from rural areas, for their hygiene practices and proneness to infections arising thereof. The study would also in a subtle way hint at safety of the milk sold by these workers.

Aims & Objectives

1. To explore the demographic, social, environmental conditions of dairy workers.
2. To assess the gaps in hygiene practices during the stages of milk collection, storage and transport of milk
3. To assess awareness regarding milk borne diseases in the dairy worker

Material & Methods

The study was undertaken with an aim of qualitatively assessing the hygiene practices and awareness regarding milk borne diseases of workers in the small scale dairy households, with a focus on cattle health management practices from September 2018 to January 2020. The results discussed are part of a larger study, which was a thesis dissertation. After due clearance from IEC in 2018 (Ref.No.KIMS/KIIT/IEC/088/2018), the study was initiated in Bhubaneswar. It had no source of funding and any conflict of interest.

Sampling: A community- based, descriptive cross-sectional survey was planned. The sample size was calculated with a presumption of 50% dairy workers maintaining hygiene practices and 50% of these workers are aware regarding milk borne diseases, at 95% desired confidence level with 20% of relative precision. Our required sample size for the current study was 100. Presuming a non-response of 10%, optimum target sample size taken was 110. But the data was collected for a larger sample of 120 small scale dairy workers from 60 dairy households, in the urban settings of Bhubaneswar

after considering the inclusion criteria. It was a challenge to achieve the requisite sample size since these workers reside scattered in slums/ semi slum areas of the city and being unorganized, there is no listing of these households. This was also the rationale behind taking 2 workers from one household, so as to get the requisite sample size.

Inclusion criteria- Resident of Bhubaneswar (>5 years), age ≥ 18 years, irrespective of the gender, engaged in this profession for at least one year and working actively in the dairy for at least 2-4 hours /day and those who consented to participate. Multistage random sampling was used to identify wards and thereon dairy households with the dairy respondents were obtained by a house to house search in each Zone of Bhubaneswar (Figure 1).

Interview and general physical examination: The participants were interviewed using the semi structured, mixed(both open and close ended) questionnaire during a house visit, by a team led by the researcher, interns and health worker. The tool was self-developed using references from similar articles from literature (10,11,12,13) and tested for internal and external validity. Expert veterinary doctors were consulted for hygiene practices in these workers and their inputs were incorporated. The tool was translated and back translated into local language Odia, for the ease of eliciting answers by researcher. The questionnaire was pilot tested in 15 households before being finalized for the study. The cattle rearing set up, practices of milking, storage and cattle rearing were observed for the requisite findings. The information included in study are observations of the researcher.

Hand hygiene practice was considered ideal if hands were washed before and after milking and prior to milk distribution, using soap and water for 40-60 seconds as recommended by WHO while **udder hygiene** practices were considered good when cleaned before and after milking, dried using towel separate for each cattle, teat sealed during mastitis or antibiotic therapy. As there are no standards of hygiene practices and no regulatory body to monitor their work, this was a profession which was built on age old practices.

The respondents were also subjected to general health check up and quizzed for relevant past histories.

Statistical analysis: Data was organized and coded in Microsoft excel sheet. Qualitative data were analyzed thematically while quantitative data were analysed using descriptive statistics. SPSS-23 was used for analysis. X 2 test and Fischer exact test were applied as appropriate and p-value of <0.05 was considered to be significant.

Results

Demographic characteristics : (Table1) indicates that more respondents(55.9%) were female (as the work requires less movement), majority (40%) were in the age group of 31-40 years and all participants were Hindus which could be because of their religious culture, who

have always considered cattle for their milk and never for meat, moreover considering the dairy work as holy affair. For the given sample, **majority were illiterate hinting that this was a profession of the less read.** Small scale dairy farms in Bhubaneswar commune are unorganized and mostly family-run. Select sample reported a mean of 18.15 years of dairy farming experience, with a minimum of 4 years and maximum of 43 years of experience. 31.7% workers had less than or equal to 17 years of experience in dairy farming while majority (68.3%) had a greater experience. 40% dairy households had migrated to Bhubaneswar from rural Odisha before 5 years or more, with respect to the date of survey. Bhubaneswar, where the study was done, is developing at a good pace since a few years and has become a commercial hub attracting people from their native places to earn a better livelihood. Thus, a span of minimum 5 years stay in Bhubaneswar was considered to assess their migration status.

86.6% workers named dairy work as their only source of income while 13.4% workers were involved in other occupation also like working as vendors, maid, shopkeeper, driver, etc. The monthly income was found to be Rs. 30,000-5,55,000.

Housing and living condition of dairy workers: (Figure 2) depicts the housing and living condition of dairy workers. 41.6% dairy households reported to be discarding the waste produced in house once daily. This was important in this study as lack of prompt disposal of waste especially of the dairy animals added to the disease enabling environment in the household. In 95% houses, there was evidence of mosquitoes. On enquiring about the source of drinking water, 61.7% households had tap supply. This proves that in spite of having a good income from the profession, the standard of living for these families were very compromised.

Our literature review does not give evidence of any study reporting findings on living conditions of the small scale dairy workers.

Cattle sheds in the small scale dairy farms : (Figure 3) describes cattle sheds surveyed in the study. Most (86.6%) reported cleaning the cattle shed once/day, although 13.4% households reported cleaning more than 3 times per day. Interestingly, workers with less experience (≤ 17 years into dairy occupation) seemed on average, to clean cattle sheds more frequently. 31.7% households reported using combination of water and any of the antiseptic solution like phenyl, carbolic acid or dettol. It was observed in 51.7% sheds that there was co inhabitation by other pets like dogs, cats and poultry besides dairy cattle in the premises. This was identified as potential cause promoting zoonotic diseases.

Hygiene practice of dairy workers during milk collection : Milking practices of small scale dairy commune were largely dependent on manual labor and family cooperation, as no automated machinery was used. All the dairy households reported milking by hand using the

knuckling technique. The low practice (25.9%) of not washing hands prior to milking (Table 2) was attributed to the fact that since milking was usually an early morning activity, undertaken after the morning toilet use or after afternoon nap, the participants speculated that their hands were clean. Also these households lacked uninterrupted water supply. It was found that only 38.3% dairy households cleaned cattle udder using warm/boiled water while rest used normal water. After udder cleaning, 23.4% households were found to be using towels to wipe the udder which was common for all the cattle and the towel was washed on alternate days by 50% households.

Hygiene practice of dairy workers during milk storage: (Table 3) shows the hygienic practices of small scale dairy household during milk storage. It was observed that none of the dairy households used filters while pouring milk from collection buckets to storage buckets while none of the small scale dairy households had milk tanks for storage. On observing if water was added to milk during storage, 26.6% dairy households did so, of which only 25% conducted procedures (mostly boiling) to make water safe to be added to milk.

Hygiene practice of dairy workers during milk transport and distribution: (Table 4) depicts good hygiene practices during milk transport and distribution. The present study reports that the practice of adulterating milk with water was carried out mostly twice - immediately after milking and prior to distribution. Judgement on the total amount and ratio of water being added to the milk could not be made since it could be considered by the participants as breach in their professional privacy.

Commercially sold milk undergoes pasteurization, while a notable amount of raw milk is consumed locally due to several traditional beliefs. It was found that 75.5% (37/49) of the dairy households that consume their own milk consume unpasteurized milk, which could pose a health risk to these consumers. On enquiring about the reason for consumption of raw milk by household members, majority (36/98) of the respondents reported that raw milk was healthy and boiling it would reduce its nutritive value.

Awareness of dairy workers on milk borne diseases: (Table 5) represents awareness of dairy workers on milk borne diseases. Every participant understood "milk contamination". On assessment of the workers knowledge on ways of contamination of milk, not covering milk stored with lid and unclean storage containers were responses of majority while 40.8% considered ingestion of raw milk to be mode of transmission of milk borne diseases. Figure 4 shows the awareness vs. practice among dairy workers on certain hygiene and disease prevention (self and cattle) measures.

Among the dairy workers with less years of experience (≤ 20 years), 74.4% were conscious regarding their hands being one of the routes for milk contamination. This was found statistically significant ($p=0.018$) which can be

attributed to the fact that they were more receptive and technologically sound i.e. having better access to information on hygiene over television or social media. The gaps in awareness and practices (Figure 4) reinforce that awareness alone doesn't pave way to changing practice, but regulations, monitoring and reinforcement for quality driven services alone can ensure good practices.

Discussion

Socio demographic characteristics - Majority of the dairy workers were aged more than 31 years in previous studies (13,14,15,16,17,18), in line to finding of current study. Ngasala et al. (2015) (19) in a study in Tanzania and Neeta et al. (2014)(11), studying dairy workers of Belgaum (Karnataka, India) reported more females, 94% participants had received primary education and 55.2% workers were illiterate, respectively and later study reported 72% Hindus as against 100% in ours. Contrarily studies from Pondicherry (14) and Southwest Ethiopia (17) report workers to be predominantly male. The study in Chandigarh shows 39% participants were qualified up to secondary level (16)

A previous study from Chandigarh reports that the monthly income from dairy ranged from Rs. 30,000-1,20,000 and their mean years into the occupation was reported to be 19.09±12.32 years (12). This was in contrary to our study where we found monthly income of Rs. 30,000-5,55,000 and years into occupation to be from 4-43 years. This may be explained by the regional preferences among the region specific population for fresh milk, who are ready to purchase it at higher costs. The higher earning may also explain the reason why this sample has dedicated more years into the profession as compared to reports from other studies (14) which reported years into occupation of dairy workers in Pondicherry to be 12-30 years, similar to our finding.

Cattle sheds in the small scale dairy farms: In contrary to the present findings, a study done in Rajasthan (20) reveals that only 38.75% dairy households kept their cattle in separate sheds whereas the study in Belgaum shows only 8.2% had separate cattle sheds(11). This variation from current study can be attributed to the general custom of people in Bhubaneswar to keep their animals in separate confinement, although not very far from their dwelling area, to fulfil the safety and cleanliness purpose within the land they have.

Current study shows 71.7% sheds inadequately ventilated, making it congested due to poor ventilation and cattle overcrowding. Improper ventilation could lead to respiratory diseases in human like LTBI(21) or breathing difficulty(22,23) due to accumulation of gas produced by cattle(24), skin infections(24,25) and on the other hand spread infection from an infected cattle to the rest(16,26). Similar to ours, a study in Rajasthan shows all the cattle sheds having kutchra floor, brick with cement walls

(51.7%), thatched roof (70.5%), few sheds(12%) having gutter for drainage(20) and only 18.25% having proper light facility due to lack of electricity in many rural areas of Rajasthan. An ideal shed should have concrete flooring as it stands cheap and durable and in the tropical climate, provides the required cool condition for animals. Moreover, rough surface prevents accidents like slipping. Finding of this study on cleaning shed daily is also in accordance to ours.

Hygiene practice during milk collection: Some previous studies(10,11,12,13,27) reported partial adoption of hand washing practice prior to milking in accordance to our finding. A study showed that washing hands prior to milking was better in upper SES class than in lower class in dairy workers of Belgaum (11) while another study in China(27) reported only 24% workers to be washing hands appropriately. This is in contrary to other studies which reported majority of the dairy workers washed hands prior to milking(20,26,28,29). For an effective hand washing, use of soap/ antiseptics stands essential. Finding of current study is nearly in agreement with that observed in Beijing, 24% showed appropriate way to wash hands, which included wetting, applying soap, rubbing for 20 seconds, rinsing and drying hands (27).

Dairy workers cleaning cattle udder as pre milking treatment in our study is in contrary to the findings of study in Belgaum (11) and Ethiopia (22) where 5.00% and 82.6% workers reported not cleaning the udder, respectively. However, many studies reported a better udder cleaning practice by 100% (14,20,29), 99.2% (30) and 87.0% (26). Use of separate towels to wipe and dry the cleaned udder is an appreciated practice to prevent udder infection and milk contamination(31). Of the dairy workers who practised udder washing followed by its drying, using common towel to dry udder was reported in our study (23.4%) but in contrary to Surkar et al. (2014)(89.1%)(13).

Post milking teat dipping into antiseptic/ warm water prevents udder exposure to flies, insects and microbial flora. This precaution was not taken in any of the dairy farms during our study which is similar to many prior studies(13,14,32). 28.4% farms in present study performed udder cleaning only before milking while 66.6% cleaned it after milking only. Belay and Geert (2015) reported 96.3% dairy farmers practising udder wash prior to milking (12) while another study reports that 50% respondents practised regular udder washing before milking in Karnataka (11) and 62% washed udder only after milking in Kerala (32).

Hygiene practice during milk storage: In the present study, none of the small scale dairy households had milk tanks for storage unlike finding of a study which reports 67% having milk tanks (33). The milk was being stored in buckets in all the dairy households taken up in our study, similar to other studies (11,13,29,34). We found only 28.3% households cleaning the milk storing containers

which is similar to finding reported by study in Belgaum(11)while study in Wardha(13) shows majority (79.1%) kept storage containers clean.

Milk contains a natural inhibitory system or temporary germicidal or bacteriostatic properties which prevents a significant rise in the bacteria count during the first 2 - 3 hours (35,36) if cooled to temperature of 4°C within this period immediately after milking that helps maintain its quality and safety for consumption (9,36).

Our study found all the dairy farms to be storing milk at room temperature which is similar to finding of the studies done by Majalija et al.(2020) (37) and Neeta et al.(2014) (11). Water was found to be the most common adulterant added to milk in our study, similar to study in Kenya (37) and Belgaum (11) while the study in Chandigarh(16)showed 85.4% not practising milk adulteration.

Hygiene practice during milk transport and distribution:

The containers for milk transport were found to be made of plastic, similar to many other studies- 75% (Majalija et al. (2020) (37), 100% (Ngasala et al.(2015)) (19). The rough surfaces of plastic containers prevent effective cleaning and sanitization and this increases bacterial contamination of milk (37). Use of aluminium or metal containers is encouraged for easy cleaning and durability. Use of masks/ caps to prevent milk contamination was practised by 19.1% dairy workers in our study in contrast to study in Beijing where 85% respondents reported wearing work uniform and cap always (27).

Commercially sold milk undergoes pasteurization, while a notable amount of raw milk is consumed locally due to several traditional beliefs. It was found that 75.5% (37/49) of the dairy households that consume their own milk consume unpasteurized milk, which could pose a health risk to these consumers, according to few similar studies (11,19).

Awareness of dairy workers on MBD: Similar finding on level of awareness regarding MBD were reported by many studies- Malija et al. (2020) (75%) (37), Neeta et al.(2014) (0%) (11), Dimphetego et al. (2010) (36.7%) (38), as majority participants didn't know that milk contamination could cause disease.

The knowledge on modes of transmission of MBD were considered to be ingestion of raw milk (40.8%) in our study in accordance with previous studies Dimphetego et al. (2010) (38), Belay and Geert (2015) (12) where it was reported to be 63.9%,35%, respectively in a better line to some other studies where none of the dairy workers knew milk to be transmitting disease (11). On assessment of the workers knowledge on ways of contamination of milk, not covering milk stored with lid and unclean storage containers were responses of majority (11,19). Finding of our study was encouraging than that reported in Ethiopia in 2017 where only 13% dairy workers had knowledge regarding raw milk consumption causing diseases (22).

Conclusion

This is a simple study with the pertinent objectives to highlight the dairy practices among the unorganized dairy workers in city.It has brought out glaring callousness among all hygiene practices, which are camouflaged by less education and unhindered demand of milk even in the city.

The city does not have any system or body to monitor work of these workers and offer them help in terms of training and funds to improvise their services. Unlike in the west where this profession is dealt with utmost importance, in our country we are evasive towards introduction of any technology or mechanics into these professions. Surprisingly no use of machines was identified, even in households who were earning very well. Machines and refrigeration can help do away with repeated hand washing and assure safety of the milk, yet none of the workers invested in these modern means.

Recommendation

It is strongly recommended that small scale professions like these to be integrated into governmental protection in terms of giving them funds and up scaling their services which will be more quality driven and serve to offer them a healthy quality of life too.

Limitation of the study

The study is rife with limitations as a robust sample could not be covered no listing of the households was done, milk safety and blood parameters of the workers could not be assessed for conclusive results, as it was entirely self-funded. Yet, it has brought out very strongly the vulnerability of these populations to milk borne diseases and also raises doubts on the quality of the milk delivered.

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Tables

TABLE 1 FREQUENCY DISTRIBUTION OF DAIRY HOUSEHOLDS (N=60) AND WORKERS (N=120) ACCORDING TO SOCIO – DEMOGRAPHIC CHARACTERISTICS

Variables	Frequency (%)
DAIRY HOUSEHOLD (N=60)	
Caste	
■ General	20 (33.3%)
■ OBC/SC/ST	40 (66.7%)
Type of Residence	
■ Kutcha	26 (43.4%)

■ Pucca	11 (18.3%)
■ Semi-Kutcha	23 (38.3%)
Ownership of house	
■ Own	6 (10%)
■ Rented	54 (90%)
Family type	
■ Nuclear	47 (78.3%)
■ Joint/3 rd generation	13 (21.7%)
No. of family members	
■ Less than equal to 4	9 (15.3%)
■ 5-8	43 (71.5%)
■ More than 8	8 (13.2%)
DAIRY WORKERS (N=120)	
Education status	
■ Illiterate	62 (51.6%)
■ Primary school	49 (40.9%)
■ Middle school and above	9 (7.5%)
Socio Economic status (Modified B.G.Prasad Scale 2020)	
■ I – Upper class	114 (95%)
■ II –Upper middle class	6 (5%)

TABLE 2 HYGIENE PRACTICES WHILE MILK HANDLING AND COLLECTION

Variables	Frequency(%)
AT INDIVIDUAL WORKER LEVEL (N=120) :	
Hand washing practised before milking*	
■ Yes	31 (25.9%)
■ No	89 (74.1%)
Hand washing done using (n=31)	
■ Soap and water (ideal)	11 (35.5%)
■ Only water	20 (64.5%)
Practice of handling milk with bare hands if wounded*	90 (75%)
AT DAIRY HOUSEHOLD LEVEL (N=60) :	
Practice of Udder cleaning	
■ Yes	47 (78.3%)
■ Sometimes	13 (21.7%)
Time of udder cleaning	
■ Before milking	17 (28.4%)
■ After milking	40 (66.6%)
■ Both before and after milking(ideal)	3 (5%)
Milk collection bucket made up of -	
■ Aluminium (ideal)	17 (28.3%)
■ Steel	14 (23.4%)
■ Plastic	29 (48.3%)
Practice of washing of milk collection buckets	
■ Yes	17 (28.3%)
■ No	43 (71.7%)

TABLE 3 HYGIENE PRACTICES AT DAIRY HOUSEHOLD LEVEL DURING MILK STORAGE, N=60

Variables	Frequency reporting the practice (%)
Cleaning of storage containers prior to pouring milk	17 (28.3%)
Storage container is kept	
■ Covered with lid	21 (35%)
■ Open	39 (65%)
Milk storage area clean and free of insects/flies	17 (28.3%)
Water is added to milk during storage	16 (26.6%)
Procedure done for making water safe to be added to milk (n=16)	4 (25%)
Fate of left out milk	
■ Added to next day's collection	21 (35%)
■ Milk products	39 (65%)
The area of milk collection and storage is same	34 (56.6%)

TABLE 4 HYGIENE PRACTICES AT DAIRY HOUSEHOLD AND WORKER LEVEL DURING MILK TRANSPORT AND DISTRIBUTION

Variables	Frequency reporting the practice (%)
AT DAIRY WORKER LEVEL (N=120) :	
Hand washing before distributing milk to consumers (n=120)	
■ Yes	16 (13.4%)
■ No	81 (67.5%)
■ Sometimes	23 (19.1%)
Cap/mask worn during distribution (n=120)	23 (19.1%)
AT DAIRY HOUSEHOLD LEVEL (N=60) :	
The inmates boil the raw milk before intake(n=49HH)*	
■ No	37 (75.5%)
■ Sometimes	12 (24.5%)
*11 HH were excluded as milk was not consumed by the inmates	
Container for transport cleaned before pouring in milk (n=46)	
■ Yes	15 (32.6%)
■ No	23 (50%)
■ Sometimes	8 (17.4%)
Milk drawn out from container using vessel with a handle	35 (58.3%)
Time taken to dispatch milk after storage : 1-4hours	60 (100%)
Milk container is properly packed while transportation	19 (31.7%)
Area within which milk is usually transported	
■ Very close to house	14 (23.4%)
■ Different ward	22 (36.6%)
■ Other zone	24 (40%)

TABLE 5 AWARENESS OF DAIRY WORKERS ON MILK BORNE DISEASES, N=120

Variables	Frequency (%)
Ways of milk contamination *-	
Due to environment	114(95%)
By hands	81 (67.5%)
Unclean udder	116 (96.6%)
During storage	93 (77.5%)
During transportation	33 (27.5%)
Milk pasteurization prior to consumption prevents milk borne diseases	49 (40.8%)
Awareness on types of milk borne disease *-	
Tuberculosis	42 (35%)
Anthrax	29 (24.1%)
Brucellosis	1 (0.8%)
Fungal	17 (14.2%)
“Milk borne disease” as a community health problem	53 (44.2%)
Vaccination prevents cattle against diseases	80 (66.6%)
* This question had multiple responses from every dairy worker	

Figures

FIGURE 1 FLOW CHART SHOWING STUDY SAMPLING

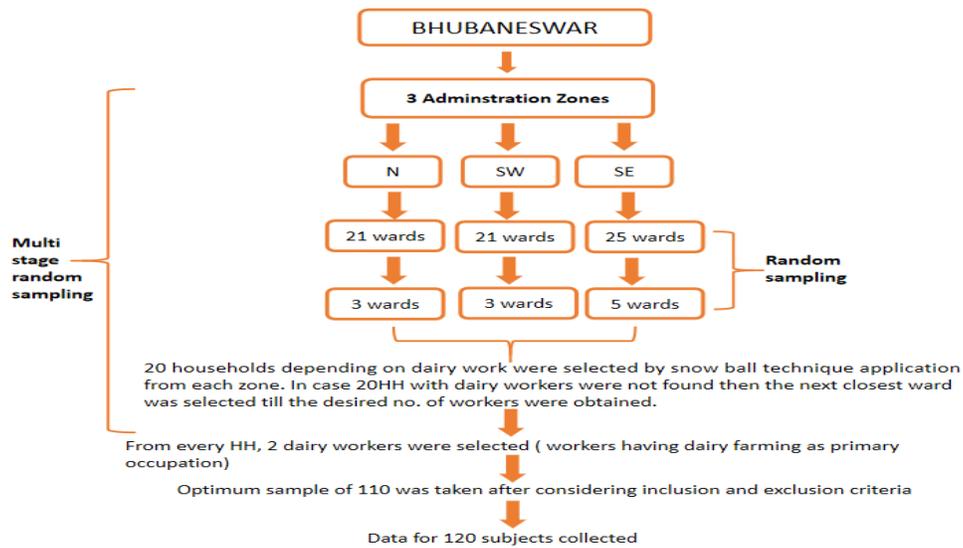


FIGURE 2 DESCRIPTION OF DAIRY HOUSEHOLD (N=60)

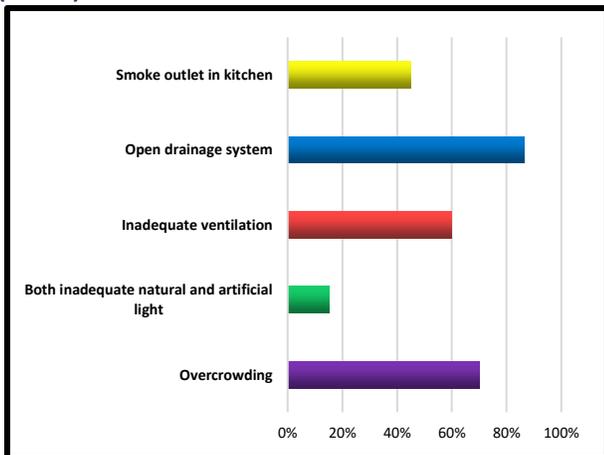


FIGURE 3 DESCRIPTION OF CATTLE SHEDS (N=60)

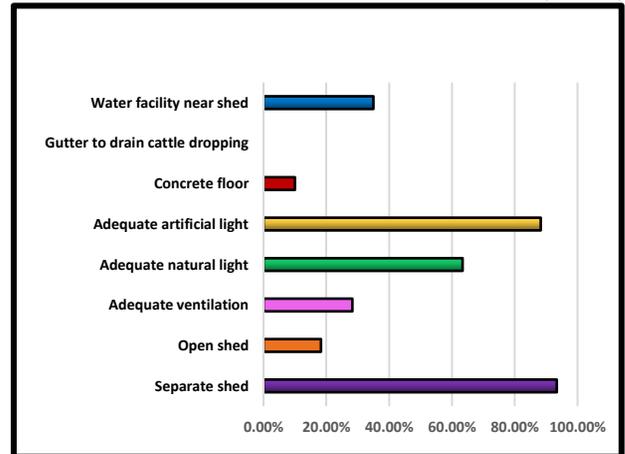


FIGURE 4 AWARENESS VS. PRACTICE AMONG DAIRY WORKERS ON CERTAIN HYGIENE AND DISEASE PREVENTION MEASURES(N=120)

