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A comparative study of Hygienic status of Butchers and Identifybacteria among the Slaughters of Meat, Chicken and Fish markets of Jagdalpur city, Chhattisgarh, India

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Abstract

Study was conducted to inspect the hygienic status of slaughter men of meat and fish markets of Jagdalpur city, India. Among five meat markets and five fish markets, it was found that the markets were of poor hygienic status. For identification, samples of bacteria present on the hands of chicken slaughter men, goat slaughter men and fishmongers were collected both during morning and night. Standard plate count of bacteria obtained during morning for chicken slaughter men, goat slaughter men and fishmongers were detected to be $7x10^5$,$10x10^5$and $15x10^5$ CFU/ml respectively in contrast to the samples taken from normal man which was around$0.4x10^5$CFU/ml. Due to poor level of hygienic status and lack of sanitary practices standard plate count was increased during night which were $9x10^5$,$50x10^5$ and $60x10^5$CFU/ml and on comparing it from the hands of normal man it was again found out to be very less i.e. $0.9x10^5$CFU/ml. During morning pathogenic bacteria i.e. Staphylococcus aureus from chicken slaughter man, Corynebacteriumdiptherae from goat slaughtermen and fishmonger were identified but non-pathogenicStaphylococcus epidermidis was obtained from normal man. During night predominance of bacteria like Kleibsiella spp., Proteus vulgaris, Shigella spp. resulted out whereas S.epidermidis was isolated from hand of normal man which is a normal microbial flora of human skin.

Keywords: Hygiene, slaughter men, fishmonger, meat market.

Introduction

Meat and fish had been an integral part of human food since time immemorial. With evolution our food habits improved and became more organized and hygienic. In India meat is primarily consumed in form of poultry, fish and goat meat. Dirty hands of workers, cloths and equipment of the slaughterhouse are considered to be as chief sources of meat contamination[1,2].

Jagdalpur, a city known as the headquarters for all government processions for the tribal belt of Bastar region in C.G state, is as much absorbed in the tribal culture as any other place in this tribal belt. The city has over 100 fish and meat shop, about 25 of which are centred at the Sanjay market, while rest are scattered all over the city.

Generally during cutting and processing the meat at slaughter houses. The microbiological contamination occurs[1]. So, meat has to be processed right from slaughtering and skinning to chopping and delivering. The hygienic status of the slaughter man and the surrounding are of great importance for both the slaughter man and the consumer.Usually the animals (goat, chicken and fish) harbour various microorganisms on their body and in their blood and flesh as well. These microorganisms disperse and get transmitted to the slaughter men and their surrounding during meat processing.

This study was performed to assess the hygienic status of the slaughter men of Jagdalpur city during the morning and night time. Since with the passing day the sale as well as the member of animals slaughtered increase and so does the amount and species of microorganisms on the body and tools of slaughter men. Being in such environment for whole day is quite troublesome as this renders the slaughter men to catch the diseases due to these microorganisms. It depends upon the hygienic practices of the slaughter men to minimize microbial growth on their body, cloths and instruments. This study covers an account of hygienic practices carried out by slaughter men of Jagdalpur and also the microorganisms that they harbour as a drawback of their profession.

Material and Methods

Study area: To assess the hygienic conditions and sanitation practices of slaughterhouses, a survey was carried out at 1st of June 2014 at chicken and goat slaughterhouse as well as fish market area of Jagdalpur located at Sanjay market, District Bastar, Chhattisgarh, India.

Sample collection: At 9:30 AM sample collection of water present at the hands of chicken and goat slaughter man as well as fishmonger was done while slaughtering the goat, chicken meat and fishes. Likewise other samples were also collected during night time around 8:30 P.M. Another water sample was

also collected from hands of normal man both during morning and night time.

Isolation of bacteria and calculation of CFU/ml: To isolate bacteria from the samples, serial dilutions were made separately for all the samples (morning and night) as well as for normal man's hand samples. Approximately 1ml of solution from appropriate dilutions (10^{-4}) of each samples, were used to inoculate nutrient agar plates for calculation of standard plate count. Plates were incubated at 37°C for 24-48 hours with the help of incubator. After incubation, number of distinct colonies on each plate of all the samples were enumerated using colony counter and colony forming units (CFU/ml) of the sample was calculated.

Identification and characterization of bacteria: For identification and characterization of bacteria, pure cultures of bacteria were made separately from mixed populations of all the samples for both morning and night time with the help of streak plate method. Same was done for pure culture of bacteria from normal man's hand sample. Streaked plates were incubated at 37°C for 24-48 hrs. After 24-48 hours of incubation, the colonies were examined for their morphology and same type of colonies was used for gram staining.Biochemical tests were carried out and pure isolates were identified after comparing their morphological and biochemical characteristics according to Bergey's Manual for Determinative Bacteriology.

Results and Discussion

Assessment survey: Assessment survey was carried out among five different slaughter houses and fishmonger shops through an interview. Their assessment cleared their hygienic status in terms of their educational status, training, washing, apron wearing, hair cover, money handling, and jewellery wearing, and cutting as shown in the observation table-1.

Standard plate count: The study recorded the standard plate count from chicken and goat slaughter man and fishmonger's hand samples obtained during morning and night time along with the sample from normal man's hand. The data obtained are shown in Table-2.

Identification and characterization of bacteria: The water samples collected were processed to identify the microorganisms present. The results for microscopic examination such as staining; motility test and colony morphology, and colony characteristics of morning and night time are tabulated in Table-3, Table-4 and table-5. Biochemical characters for samples are shown in the Table-6 and table-7.

Discussion: Total of 5 slaughter houses and 5 fishmonger shops were interviewed. 76% of the workers were illiterate and 94% of the slaughter men were not trained for slaughtering operations. Assessment revealed that 96% of them used only water for washing purpose and only 3.3% of them used soap with water and 80% of them used the same water whole day continuously for washing and processing purpose. None of the workers in fishmonger shops and slaughterhouses wore aprons nor covered their hairs. 98% of the fishmongers received money directly during serving and 95% of slaughter men worn jewellery. 75% of the workers used to cut the meat and fishes directly on floor, while only 25% of them used to process the meat over table.

Table-1
Tabulation for results of questionnaire survey on knowledge of slaughter man and fishmongers on hygienic practices in Jagdalpur, C.G, India

S.No.	Observations	Values	Percent
1.	Educational status	Illiterate	76
		Literate	24
2.	Training	Yes	6
		No	94
3.	Washing	Only water	96
		Water and soap	4
		Already used water	85
		Fresh water	15
4.	Hand gloves and apron	Used	0
		Not used	100
5.	Hair cover	Covered	0
		Not covered	100
6.	Money	Cashier money handler	2
		Slaughter man and fishmonger money handler	98
7.	Jewellery	Worn jewellery	95
		Not worn jewellery	5
8.	Cutting	On floor	75
		Over table	25

Table-2
Tabulation for results of standard plate count of bacterial colonies from chicken slaughter man, goat slaughter man and fishmonger's hand samples obtained during morning and night time as well as from normal man's hands

S. No.	Hand Samples	CFU (at dilution 10^{-4}) (CFU/ml)	
		Morning	Night
1.	Chicken slaughter man	$7x10^5$	$9x10^5$
2.	Goat slaughter man	$10x10^5$	$50x10^5$
3.	Fishmonger	$15x10^5$	$60x10^5$
4.	Normal man	$0.4x10^5$	$0.9x10^5$

Study showed no personal and public hygienic precautions are adopted by the slaughter man and fishmongers which are necessary for them while cutting and processing the meat and fish. The study recognized that trainings are necessary for the workers processing meat and fish to reduce the microbial contamination. In these trainings they should be taught about all the precautions which is to be taken whole day while cutting

and processing. Since it is necessary to wear apron over other clothing and hand gloves to protect the meat products and the slaughter men from direct or indirect contamination, the result showed that no workers used use to wear neither apron and hand gloves nor cover their hair.

Table-3
Tabulation for results of staining; motility test and colony morphology both during morning and night time

S. No.	Hand Samples	At Morning			At night		
		Gram staining	Motility	Morphology	Gram staining	Motility	Morphology
1.	Chicken slaughter man	G+ve	Non motile	Cocci (irregular clusters)	G-ve	Non motile	Rod
2.	Goat slaughter man	G+ve	Non motile	Rod	G-ve	Motile	Rod
3.	Fishmonger	G+ve	Non motile	Rod	G-ve	Non motile	Rod
4.	Normal man	G+ve	Non motile	Cocci (irregular clusters)	G+ve	Non motile	Cocci (irregular clusters)

Table-4
Tabulation for results of colony characte*ristics obtained during morning*

S. No.	Hand Samples	At morning					
		Colony surface	Colony Colour	Density	Colony shape	Margin	Elevation
1.	Chicken slaughter man	smooth	Golden	Opaque	Circular	Entire	convex
2.	Goat slaughter man	rough	Greyish	Translucent	Circular	Wavy	flat
3.	Fishmonger	rough	Greyish	Translucent	Circular	Wavy	flat
4.	Normal man	smooth	Whitish	Opaque	Circular	Entire	convex

Table-5
Results of colony characteristics of bacteria isolated from hand samples at night

S. No	Hand Samples	At night					
		Colony surface	Colony colour	Density	Colony shape	Margin	Elevation
1.	Chicken slaughter man	Smooth	White	Opaque	Dome shaped	Entire	Convex
2.	Goat slaughter man	Smooth	Creamy	Transparent	Circular	Even	Raised
3.	Fishmonger	Smooth surface	White	Translucent	Circular	Entire	Convex
4.	Normal man	Smooth	Whitish	Opaque	Circular	Entire	Convex

Table-6
Biochemical characteristics of the isolated organisms from hand samples of chicken slaughter man, goat slaughter man and fishmongers while cutting meat and fishes during morning time

S. No.	Hand samples	Indole	MR	VP	Citrate utilization	Amylase	Catalase	Coagulase	H_2S Production	Fermentation			Identified organisms
										Glucose	Sucrose	Lactose	
1	Chicken slaughter man	-	+	+	-	-	+	+	-	+	+	+	*S.aureus*
2	Goat slaughter man	-	-	-	-	+	+	-	+	+	-	-	*C. diptheriae*
3	Fishmonger	-	-	-	-	+	+	-	+	+	-	-	*C. diptheriae*
4	Normal man	-	-	+	-	-	+	-	-	+	+	+	*S.epidermidis*

Table-7
Biochemical characteristics of the isolated organisms from hand samples of chicken slaughter man, goat slaughter man and fishmongers while cutting meat and fishes during night

S. No.	Hand samples	Indole	MR	VP	Citrate utilization	Amylase	Catalase	H_2S production	Fermentation			Identified organisms
									Glucose	sucrose	Lactose	
1	Chicken slaughter man	+	-	+	+	+	+	-	+	+	+	*Klebsiella species*
2	Goat slaughter man	+	+	-	-	-	+	+	+	+	-	*Proteus vulgaris*
3	Fishmonger	-	+	-	-	-	+	-	+	-	-	*Shigella species*
4	Normal man	-	-	+	-	-	+	-	+	+	+	*S. epidermidis*

Exchange of paper currency many times facilitates a big surface area for existence of pathogens[5]. According to the present study only 98% of the butchers handled money by themselves simultaneously during cutting and processing the meat and fishes. The fact that slaughter men are chief sources of contamination and applicable precautions should be followed to remove contamination[6]. The same type of case study about hygienic status assessment was reported earlier that there are absence of knowledge on hygienic practices among slaughter men which was to be followed[7]. The assessment result showed that 85% of the butchers of fish and meat markets used same water for washing and cutting the goat, chicken and fish meat continuously the whole day without changing it and only 4% of them used soap for washing their hands.

This opens the door for spreading of numerous of pathogenic microorganisms from the hands of slaughter men and fishmongers. The main source of bacterial contamination in carcasses. At the slaughter house came from water and slaughter equipment[8]. According to the result 75% of the workers used to cut meat and fishes over the floor which gets more and more contaminated after each and every operation they performed and the dirty floors are chief source of contamination[9].

The results showed that standard plate count obtained from hand samples of the water present on hands of chicken, goat slaughter man and fishmonger during morning was $7x10^5$ CFU/ml,$10x10^5$ CFU/ml and $15x10^5$CFU/ml. when it was compared from standard plate count of water samples obtained from hands of normal man it was very less i.e. $0.4x10^5$CFU/ml as shown in figure-3, figure-4, figure-7, figure-8, figure-11 and figure-12. Again on comparing the count of all the three samples collected during night from them it was found to be increased which was $9x10^5$ CFU/ml, $50x10^5$ CFU/ml and $60x10^5$ CFU/ml for chicken, goat slaughter man and fishmonger and again on comparing each of the night counts from the counts obtained from hands of normal man it was $0.9x10^5$ as shown in figure-5, figure-6, figure-9, figure-10, figure-1 and figure-2. This study cleared that the microbial load which was obtained from the samples of slaughter men and fishmongers during night was highest than during morning which can be clearly indicated graphically as shown in figure-21 resulted out because of absence of hygienic practices like sterilization, use of same contaminated water whole day without soap.

Results indicated the predominance of Gram positive bacteria obtained after staining as shown in Figure 13, Figure 15, Figure 17, Figure 19 and Figure 20. during morning time and due to lack of sanitary practices and hygienic conditions like use of pure water for washing, use of antibacterial soaps, neat and cleaned floor opened the door for the survival of many pathogenic gram negative bacteria during night as shown in Figure 14, Figure 16 and Figure 18. Graphical study was also performed as shown in Figure 21 which should higher microbial load during night time as compared during night time. According to one earlier study conducted at Karachi, Pakistan, the predominance of gram negative organisms were reported in spreading contamination among meat slaughterhouses[10].

After performing biochemical tests, *S. aureus, C.diptherae, C.diptherae* and *S.epidermidis* was obtained from hand samples of chicken slaughter man, goat slaughter man, fishmonger and normal man during morning. *Kleibsiella spp., Proteus vulgaris, Shigella spp., S.epidermidis* was resulted from chicken slaughter man, goat slaughter man, fishmonger and normal man during night. On comparing all these pathogenic isolates from the isolates obtained from hands of normal man both during morning and night time was non-pathogenic gram positive non motile coccus arranged in irregular clusters i.e. *S.epidermidis* was obtained. *C. diptheriae* is a gram positive rod shaped non motile bacteria causative agent of the diphtheria in human beings. Generally founding the mouth, normal skin flora of humans and animals, bodily secretions, soil, water, food products and gets spread through direct contact[11,12]. Cultivation of *C.diptherae* was reported from meat processing waste products of slaughterhouses[13].

Figure-1
Morning sample from chicken slaughter man

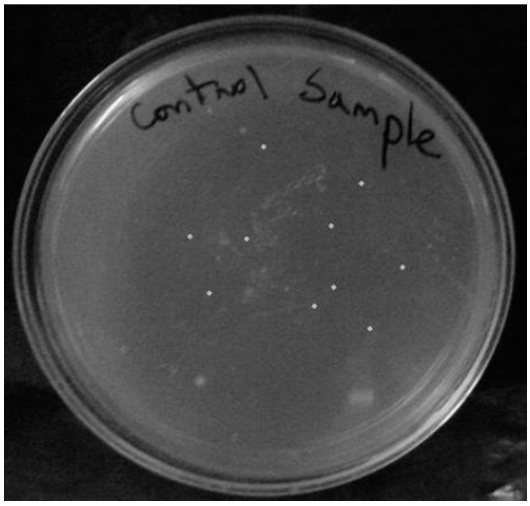

Figure-2
Morning sample from normal man

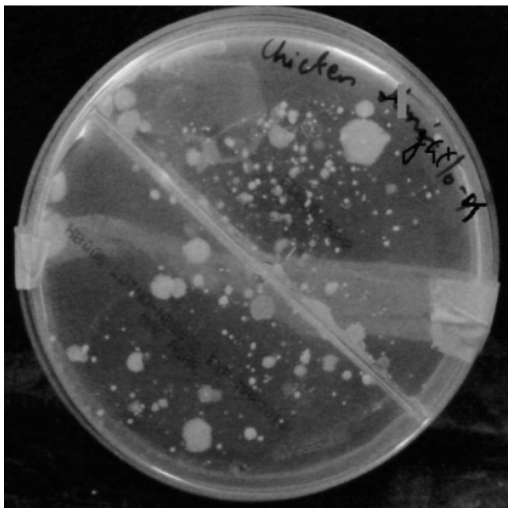

Figure-3
Night sample from chicken slaughter man

Figure-7
Night sample from goat slaughter man

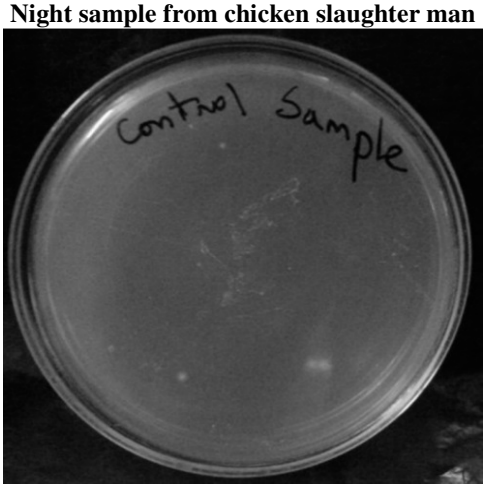

Figure-4
Night sample from normal man

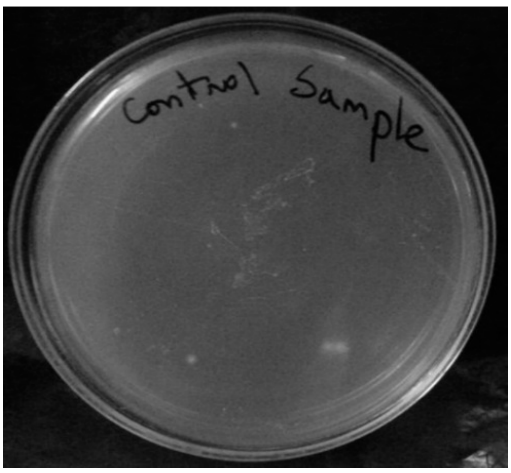

Figure-8
Night sample from normal man

Figure-5
Morning sample from goat slaughter man

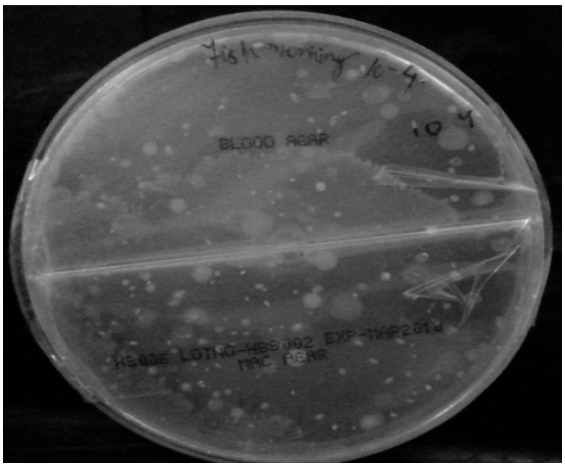

Figure-9
Morning sample from fishmonger

Figure-6
Morning sample from normal man

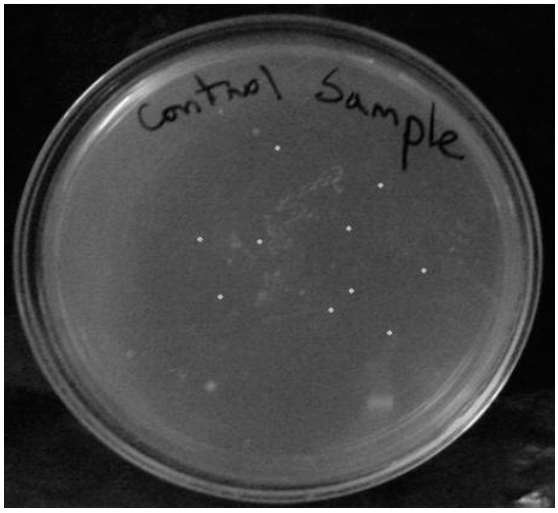

Figure-10
Night sample from normal man

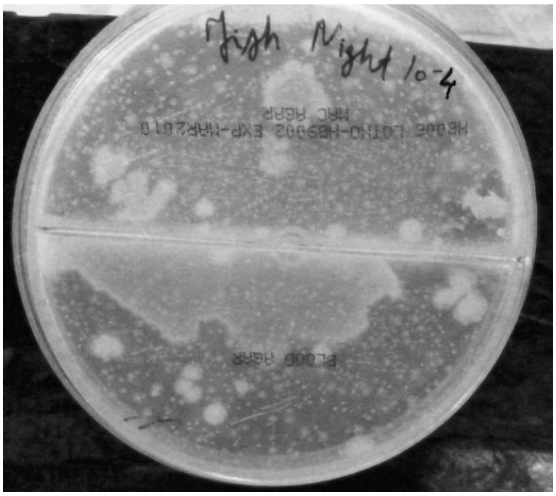

Figure-11
Night sample from fishmonger.

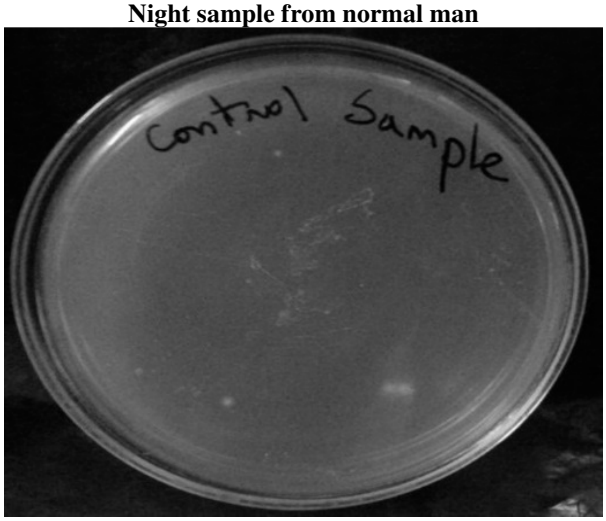

Figure-12
Morning sample from normal man

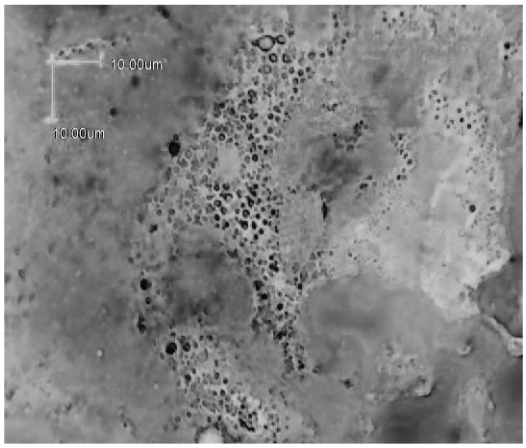

Figure-13
Gram +ve cocci in irregular clusters isolated from hands of Chicken slaughter man during morning

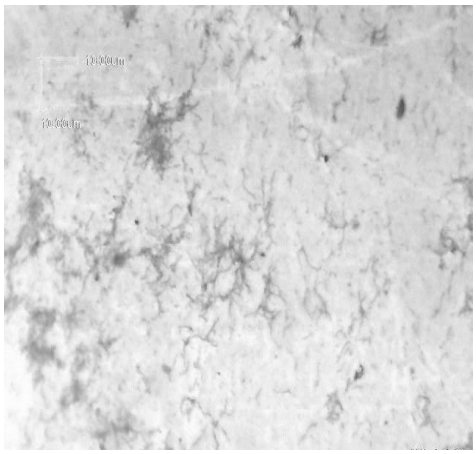

Figure-16
Gram –ve rod shaped bacteria. Isolated from hands of goat slaughter man during night

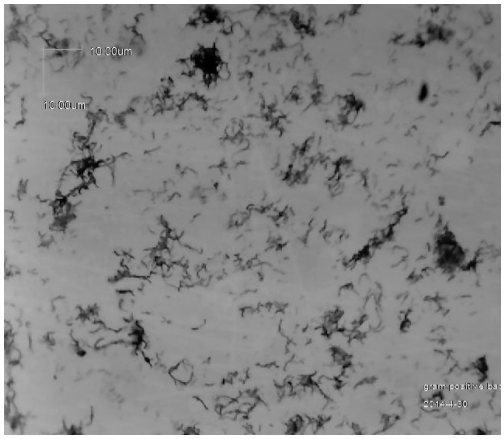

Figure-15
Gram +ve rod shaped bacteria from hands of goat slaughter man during morning

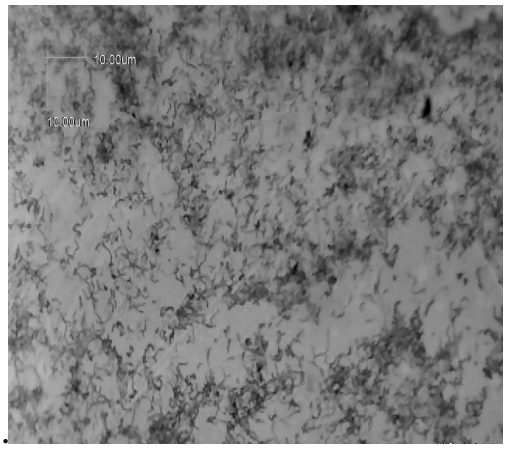

Figure-17
Gram +ve rod shaped bacteria isolated from hands of fishmonger during morning

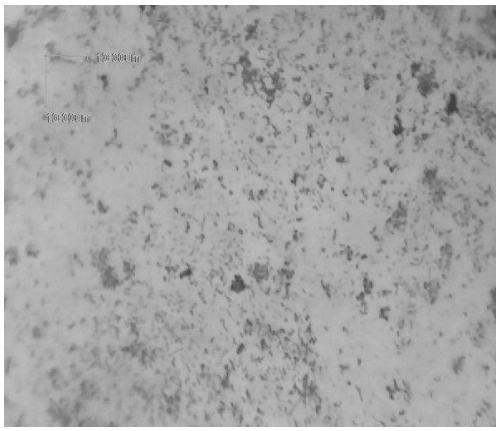

Figure-14
Gram –ve rod shaped bacteria isolated from hands of Chicken slaughter man during night

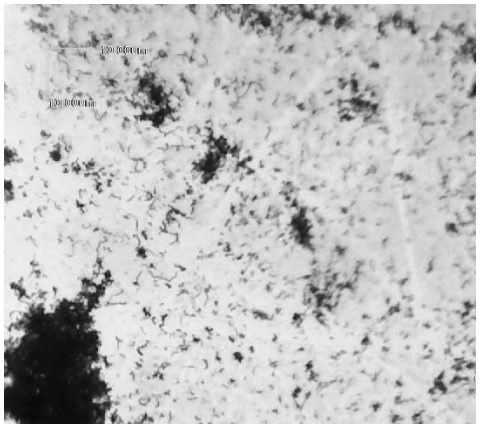

Figure-18
Gram –ve rod shaped bacteria isolated from hands of fishmonger during night

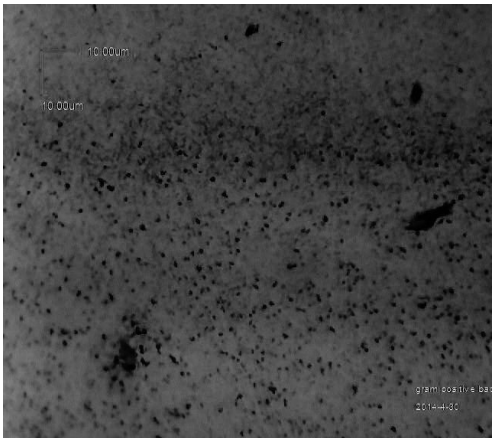

Figure-19
Gram +ve cocci in irregular clusters isolated from hands of normal man during morning.

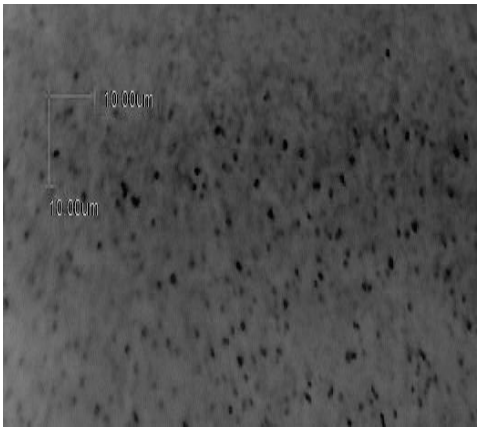

Figure-20
Gram +ve cocci in irregular clusters isolated from hands of normal man during night

Proteus vulgaris is gram –ve motile rod shaped bacteria, found in soil and water. A total of 10 different bacterial isolates from both the raw meat and tabletop swabs from which Proteus vulgaris [12(6.2%] was isolated[14]. *Shigella Spp.* generally considered to be as a causative agent for dysentery are, shigellosis are gram negative non motile bacteria. *Shigelladysenteriae* was also reported as a pathogenic bacteria in edible fish[15]. Lastly we can say that all the pathogenic microorganisms were isolated from hand samples of slaughter men and fishmongers and when it was compared with isolate obtained from normal man non-pathogenic gram positive coccus *S.epidermidis* was obtained. *S.epidermidis* generally shelters on skin flora and is generally not always pathogenic[16]. The hands of workers were the chief sources of contamination and the results of present study satisfies his conclusion to some extent[17].

Conclusion

The present investigation and study concluded poor level of hygienic status among the chicken, goat slaughter men and fishmongers of Jagdalpur city. Due to this poor sanitation and poor level of hygienic status assessment the load of pathogenic bacteria goes on increasing from day to night. The study revealed that the workers working at the slaughterhouses and fishmonger shops did not apply hygienic practices while cutting and processing the meat because of scarcity of knowledge and training operations. According to the different types of pathogenic bacteria isolated from different hand samples of slaughter men and fishmonger and their load both during morning and night time could contaminate the meat and fish products through direct or indirect contacts with contaminated surfaces in slaughterhouses.

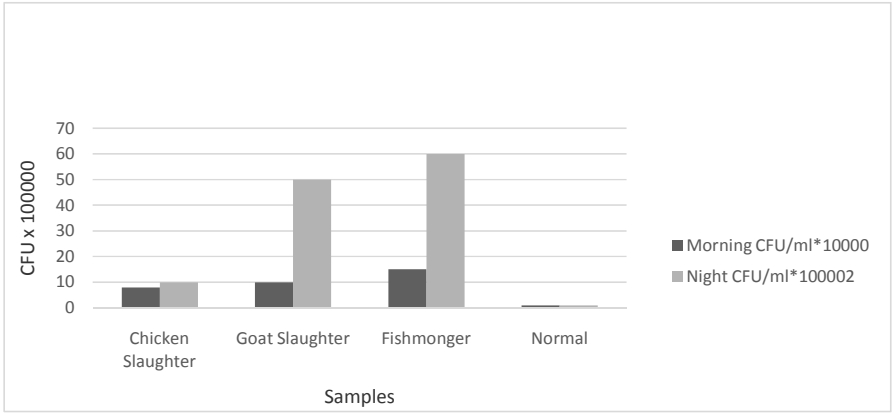

Figure-21
Graphical comparative study indicating highest microbial load during night time to that obtained during morning time

According to the present study it was found that non-pathogenic isolate that too at lowest microbial load was obtained from normal man both during morning and night. So it can be easily concluded that more and more pathogenic microorganisms are present on hands of slaughter man as well as fishmonger. Thus to protect the people against food borne pathogens and infections, and to avoid contaminations, precautions like use of fresh water, sterilized equipment and disinfectant soaps should be followed seriously among slaughter men during slaughtering the meat in order to maintain good hygienic conditions in slaughterhouses. Government public health departments should take adaptive measures to conduct training for slaughtering operations compulsorily for slaughter men in order to avoid microbial contaminations which generally occurs in carcasses.

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