5 DISCUSSION:

Antimicrobial resistance (AMR) is basically considered as when microbial infections cannot be treated with lesser than two antibiotics used to treat or prevent infection. The three main ways by which resistance occurs, known to us are: by natural resistance in some pathogenic strains, by alteration in genes, or by acquired non-susceptibility in which one species acquires resistance from another. Resistance can happen spontaneously owing to random mutations, to formation of resistance over time, or by improper usage of antibiotics. The latter two pathways are considered to be the most important. The limitation of treating the non-susceptible bacteria is that the higher and stronger medications are too used to treat the infections which get costlier and the side effects. Thus the treatment of non-susceptible bacteria gets harder. Bacteria that are not affected by many of the antibiotics are known as multidrug resistant (MDR); to report these bacteria in common language, these are called as superbugs. Because of MDR bacteria, the non-susceptibility of bacteria to many antibiotics has increased the fatality rate by millions of death annually. Sometimes, few of the infections are not treated by any of the antibiotic. All classes of microbes present of all types impart non-susceptibility to their antimicrobial agents. Fungi have been seen to get resistant to antifungal agents, virus to antiviral agents, protozoa to antiprotozoal drugs and so on. Among the microbes, the antibacterial drug resistance is the most common resistance that has risen globally.

The antibiotic resistance, occurring naturally is getting common these days (Kiratisin et al., 2008). It has been found that, the genes imparting resistance to bacteria have been seen since the antibiotics were developed (Lartigue et al., 2005). The environmental resistomes are the genes that provide resistance to bacteria (Kiratsin et al., 2008). The genes are transferred from non-pathogenic to the pathogenic bacteria that are able to produce illness. This also leads to leading to important antimicrobial non-susceptibility (Kiratisin et al., 2008). Penicillin-resistant bacteria that were having the enzyme penicillinase were also reported in the year 1952, even before the commercial use of penicillin was strated (Lau et al., 2008); and also preexistence of bacterial resistance to streptomycin (Messai et al., 2008). In 1962, Bacillus *licheniformis* was the bacteria which proved to be very important for research by showing the enzyme the presence of
penicillinase from its dormant endospores, grown from soil on the plant roots. These roots were for the research purposes year 1689 by Britain (Mohamed et al., 2006). In one research by William Braine and John Hartnell, different six types of clostridium were found from the stool samples. These bacteria were seen non-susceptible to cefoxitin and clindamycin (Pallecchi et al., 2007). Penicillinase was considered to be developed a protective process for microbes where they live, like in Staphylococcus aureus with high levels of penicillinase that lived with penicillin-producing Trichophyton, which was observed that this could have been developed circumstantially (Paterson et al., 2003). Penicillinase ancestors are these days have become he current focus of result. Especially the proteins that have found to bound to these enzymes are of prime concern to find and to study (Pitout et al., 2007). The research reported that the antibiotic resistance seen in clostridium strains was found to be due to the regular dealing of Braine's and Hartnell's with bacteria, that raised the chances of intrinsic resistance or the spontaneous genetic alterations in Clostridium (Quinteros et al., 2003). There have been observations reporting that the There is evidence that pollutants having heavy metals and other elements may too stimulate the bacteria to resist particular antibiotics (Quinteros et al., 2003).

Not only humans but the environment and animal too are being affected by antibiotic resistance. Regarding the concerns on resistance, the main hot areas that are highly involved in spread of contamination of antibiotics as well as bacteria are mainly wastewaters from industry and health care centres. This has a serious hazard on public health.once the antibiotic is given to he ptient, it has to enter the environment through human waste, that antibiotic mingle in the environment and surroundings medication, agricultural activities, live stock handling and last but not least tha pharmaceutical waste. These are thus termed as Hot spots of antibiotic spread and contamition ot environment.

Not only antibiotic are released in the environment, but the pathogenic, non-susceptible bacteria also are directly spread in the surroundings. The rate of replication is directly proportional; to the rate of spread of resistance genes in environment, which we all know that is very fast.

Not only these resistant bacteria spread their genes to their offspring but the resistomes are transferred to the susceptible bacteria lying in the environment too. The new chain of spread of resistance among bacteria that were once sensitive starts flourishing here also. To our
knowledge, the bacteria have left no chance spreading the resistance to bacteria through any mode.

Hence we can imagine that even in the absence or stopped use of any antibiotic, the resistance genes once in environment will transfer the resistance for so long, which is making the medical professional helpless to stop the resistance from any way (Song et al., 2009).

So whenever the health care or awareness campaigns are executed, the prime most stress is put the wise use of antibiotics with proper prescription from health care professionals. Avoidance of antibiotics in simple infections is also the need of the hour that should be told to lay people (Goossens et al., 2005). However in developing countries, the illiteracy has worsened the situation, the quacks are followed more than a professional doctor and little knowledge of drug is taken as full knowledge and the antibiotic consumption here is taken so lightly by layman. Before advising antibiotic to the patient, right antibiotic, with right dosage, route and time must be noted. Moreover, where narrow spectrum antibiotics can work, broad spectrum should be avoided. Cultures tests of the infected samples must be followed for the empiric as well as later on specific therapy of the patient and the treatment must immediately be changed with report.

The education to lay people must be thoroughly provided. The people who rely on be self-administration of medication, they must be told about the limitations of self medication.

However, the medical professional should be stringent to the ahnd hygien practice between every patient visit and he should encourage the patients and the attendants of the patients for the same (Griebling et al., 2007).

Basically antibiotics have been found for drug resistance in three ways. These are the human usage of antibiotic, animal usage of antibiotic and the spread of resistance between human and animals.

We know that the negative pressure exerted on anything can lead to the death of that or to the higher chances of survival. Same happens in the case of bacteria. The antibiotic that is given to the patient to kill the bacteria particularly, keeps the negative pressure on the on the bacteria. Few bacteria by this pressure are killed and rest of the bacteria learn to survive under this
pressure, indirectly by introducing resistance to particular antibiotic, which becomes the first reason that how bacteria get resistant and flourish easily with new resistance genes. There is strong need of antibiotic substitutes to cope with the current problem.

Although the simplest and common help in tackling with the resistant bacteria is the production of new antibiotics. But the resistance has become too tough to tackle that very few newer antibiotics could be developed. In many cases the developed drugs could get the approvals too.

There has been a monitoring program introduced to the world by The Centers for Disease Control and Prevention (CDC). This program notifies the drug resistant bacteria that are getting commoner.

This program has listed 18 drug resistant bacteria in America that include Methicillin-Resistant Staphylococcus aureus (MRSA), Vancomycin-Resistant S. aureus (VRSA), Extended Spectrum Beta-Lactamase (ESBL), Vancomycin-Resistant Enterococcus (VRE), Multidrug-Resistant A. baumannii (MRAB).

In year 2014 WHO stated that antibiotic resistance is now occurring globally and should be considered as a serious threat to cope with. Although the geographical distribution of the antibiotic resistance is not known exactly, but the epidemiological data on resistance has shown that the most common countries with high resistance rates are developing countries with lesser facilities to treat the ill and to tackle with antibiotic resistance.

Like penicillin and identification of penicillinases, the same happened in case of Methicillin. When the antibiotic Methicillin was discovered in year 1960, Methicillin-resistant Staphylococcus aureus (MRSA) too was isolated then. There was fall seen in many countries about infections in the decade of 70’s, but simultaneously the rise was seen in many countries. After a study of clones by MLST it was found that only few clones of bacterial gene were found everywhere, indicating that the resistance was spread from little number of similar clones. By the test MLST, it was found that MSSA were transferred with a mobile gene that imparted resistance and made them resistant to methicillin. The gene was known as SCC mec (Robinson and Enright, 2003).
When the MRSA were tested by single nucleotide polymorphism analysis, the result suggested opposite to the general theory, which conclude that the presence of SCCmec was 10 time common in bacteria than expected (Nubel et al., 2008).

First case of community acquired MRSA was reported in year 1999 and the prevalence of MRSA were approximately 30% (CDC, 1999). The surprising factor is that the cases of Ca-MRSA were found more commonly in the young population with no underlying predisposions. The characteristic infection of MRSA was Skin and tissues. These bacteria were normally found sensitive to ciprofloxacin, clindamycin, gentamicin and trimethoprim/sulfamethoxazole. The bacteria isolated were identified to have the exotoxin gene encoding for Panton–Valentine, leukocidin genes. These were most commonly hospital acquired (Naimi et al., 2003).

The difference was also observed in dissimilarity of the bacterial strains isolated from some other hospitals (Naimi et al., 2003). The epidemic emergence of MRSA was also seen in South-West Pacific, North America, Europe and elsewhere (King et al., 2006).

The few antibiotics are left in which the antibiotic resistance has been found to be low but seen also e.g., Vancomycin resistance and Linezolid resistance in MRSA. The genes of resistance to these antibiotics are VIM and IMP found rare.

The surveillance studies wherever has been conducted, have resulted same thing about antibiotic resistance rise. Though the resistance among various place was different for different antibiotics but the rates were high.

There are evidences of the clinical pressure as well as commercial pressure that that induce the patients to take antibiotics for minor infection. The mobility of population globally is also the factor responsible for increasing resistance. But the phenomenon will be continuing.

Latest antibacterial agents like Colistin have also faced resistance by bacteria like Klebsiella. The older antibiotics are left with no hope for further uses. There are many steps that have been taken to educate the population for wise use of antibiotics. Moreover, people are educated with the epidemiology, distribution and prevalence of the resistant bacteria. Their mode of transmission should also be told to community in simple ways. In spite of these efforts there is no slow down in the pace of pathogen at their end than the new developing antimicrobial agents.

It is studied that the antimicrobial resistance the cost of management of sickness is highly increased. The rate of resistance to is directly proportional to the fatality.
It is very clear that Antimicrobial resistance directly increases the morbidity, mortality and costs of management of infectious diseases. In earlier days the threat of MDR was not so big. But the industrialization has increased it greatly. There are many bacteria that spread globally from single gen e.g., Penicillin-Resistant Streptococcus pneumoniae (PRSP) (Klugman, 2002).

The most common mechanism of transfer of genes is always considered to be as Horizontal gene transfer. Although there are many more mechanism discussed for the dispersion of genes e.g., through plasmids, conjugation and so on, the Gram negatives adopt the plasmid methods commonly to impart resistance. In initial years, Shigella was isolated to have plasmids for carrying the resistance genes. E.coli was also reported earlier to have resistance genes carried by plasmids (Watanabe, 1963).

By the virtue of Plasmids’ mosaic structure, which can be arisen by recombination and transposition the bacteria are capable of dispersing genes of resistance through conjugation also (Leplae et al., 2006). mosaic structures are complex and thus pose obstacles during the detailed study on structure f structure and relationships of plasmids (Osborn et al., 2000).

Type of plasmid Inc HI1 has been used to test on multilocus sequence typing (MLST). This technique has circumvented to plasmids of Salmonella enterica serovar Typhi. Restriction fragment length polymorphism (RFLP) detailed about plasmids that the one nucleotide polymorphism was evolved by acquisition in core genes, this was the subject considered to be as variation in structure that was driven exogenously. According to the study that resistance by plasmids was different after the year 1993 that was seen before 1993. Plasmids distributed throughout the world after 1993 were quite different from those occurring before 1993. This suggests that despite the selection antibiotic that maintains the resistance genes. Plasmids that encode same character compete with each other there are no clear data that signifies the bacterial cell and plasmid interactions, but due to any interactions the plasmids rapid evolution in the spread of resistance needs to be studied. MDR bacteria participate greatly in imparting resistance at high level to another bacteria by carrying many resistance genes altogether.

Another interesting fact about bacteria is that, the bacteria that are considered to be as harmless to humans or animal, like commensal in the intestine of humans and animals or the bacteria that cause opportunistic infections can present themselves as reservoirs of the resistance genes.

For An instance, CTX-M-2 ESBL genes that are present in E. coli were found in the food items like chicken meat that were imported into the UK from Brazil. 50% of chicken breasts were
found to be as positive or this gene. This was of utmost significance and was the common type of gene present through the country in humans (Warren et al., 2008). Another reason of spread or evolution in resistance could be the environmental spread of genes. The spread of antibacterial drugs and the resistant genes in the surroundings, enrich both Multi drug resistance and the vectors (plasmids and integrons). According to a study, the ammonium compounds released from fabric-conditioning chemicals into a reed bed system has been found to be the common source of Class I Integrons. This acts as a main method of transmission of antibiotic resistant genes though HGT (Gaze et al., 2005). The clones of MRSA i.e., ST398 and MSSA i.e., ST9 are found commonly in swine, thus being a common and a close source of infection (Kehrenberg et al., 2009). Moreover, ESBL genes from animals are being found in E. coli and Salmonella spp. (Garcia-Fernandez et al., 2008).

The positive rate of all samples in our study was 40%. This result lies parallel with the findings of study by Bahashwan and Saleh (Bahashwan and Saleh, 2013) in which the culture positive samples were approximately 40%. The positivity of the culture tests depends on many factors like the role and significance of microbes that also impacts on the culture positivity. Some of the microbial growth may be critical for patient by its higher survival powers in body, which provides more chances of growth on culture media that in turn increases the positivity rate of culture tests. On the other hand, the type of bacteria may also play a role in increasing or decreasing the chances of growth on culture media. If the microbe is easily eradicated by antibiotics or by body’s healing mechanisms, the bacteria may not grow in culture plates thus leading to decreased culture positivity rate.

According to our study, the male patients were found to be more prone to infections than the female patients. This is in accordance to the study by Jui and Jonathan. The reason for this could be the basic differences in males and females. These basic differences between men and women are found at every physiological state, starting from the organism as a whole, the organs systems or organ and each cell. As these biological differences are complicated, these may impart some advantages to both males and females according to the causative agent. Different anatomy and hormones for males and females affect the process of the infection. It has been found that X chromosome help in taking up the immune system responses of body, which could be the possible reason that why males were more prone to some infections (Institute of Medicine, 2001).
According to our study, urine samples were received maximum in number. This was followed by pus samples and all body discharges and then by blood samples. The number of urine samples clearly indicates that the urine related problems i.e., Urinary tract infections are more prevalent in our region than other infections as other studies has also shown (Griebling, 2007). The reason for high rate of urine infections could be urination habits, clothing or some birth control measures, which lead to UTI. Urinary tract infections are also studied as the second commonest type of infection among humans where the number comprised of mainly with the females. That is due to the reason that UTI is very common among females because of the anatomy of females as discussed earlier that different anatomies support or stop the growth of different bacteria. The urethra of females is shorter, that allows bacteria to quickly access to the bladder. Also, the location of female urethra that is closer to vagina and anus play a significant role in making the females prone to infections (Griebling, 2007).

As urinary tract infection (UTI) is one of the most common infections in the society also. The assessment of the adequacy of the empirical therapy in community is required.

In order to assess, the common bacteria and the resistance along with positive rate of urine infections, a 10 year study was conducted in Portugal. The study conducted by Linhares and his coworkers, where out of 155597 samples of urine, 18797 (12.1%) were culture positive for bacterial growth in urine. UTI was more frequent in women (78.5%). Present work is in accordance to this study where females are seen more prone to infections and its incidence changes with age, affecting the elderly patients more (38.6%). According to the study, the most common pathogen causing UTI is E. coli. According to the study there were many other bacterial patterns observed that differed from previous studies. UTI causing bacteria varied with the sex of the patient, e.g. P. aeruginosa a major cause of UTI infection in men than in women. That too lies parallel to our study. Over the study period, the incidence of the main bacteria changed in females’ E.coli was seem to be the most common pathogen.

According to their study, the age and sex wise differences must be taken into consideration at the moment of selecting empirical therapy of antimicrobials. According to the study there, the recommended antibiotics are pivmecillinam and nitrofurantoin by the European Association of Urology guidelines, for the first line drugs and the alternative antibiotic AMXCLA( amoxicillin-Clavulinc acid) are most suitable to treat community-acquired Urinary tract infections,
according to the research conducted it has been observed that for the treatment of male infections the fluoroquinolones were not be appropriate. Moreover the SXT (trimethoprim-Sulfamethoxazole) should be skipped to treat UTI at this level. In our study blood samples were found to be the third common type of samples received for cultures. Blood samples were very less in number as compared to other samples. The reason for lesser blood culture tests may be that these infections diagnosis is based on clinical presentation of infection i.e., observation due to a presumed infection of at least two systemic inflammatory response syndrome (SIRS) criteria. This is why samples of blood are not often collected for diagnosis of infections. This finding also matches with the finding of Jui and Jonathan(Jui and Jonathan, 2011), which stated same reason for lesser blood cultures for diagnosis of infection. According to the results of our study has shown there is no difference between the positivity rate of both males and females, from which, we could confer that in this region of Punjab both male and females are equally prone to blood infections.

Pus and wound infections were the second common infections according to the present study. Whereas, according to the study by Griebling, urine infections stand at number two in all infections(Griebling, 2007). The reason of the difference in our study could be the immunity of people in region Nawanshahr, which could be weakened, where the chances of abscess formation are more. In spite of smaller district, there could be the higher incidence of people with decreased immunity, which further could be studied and this could be the reasons of reduced host immunity, making the patient prone for abscess and pus infections. According to the results, male patients were more prone to pus infections. This finding lies with the finding of Hatem and Saleh (Hatem and Saleh, 2013). This may be due to exposure of more males at work and to work related injuries.Jui and Jonathan also reported more males involved in pus infections than females, due to their exposure to hard and tough jobs(Jui and Jonathan, 2011).

Body fluid samples were collected almost as same as blood samples in number. Since the body fluids generally are considered sterile and are present deep inside the organs, they are difficult to be approached by microorganisms. So the chances of these infections are generally low. In our study, females were reported for more body fluid infections. This finding is different from the findings of Verma where more male patients were reported having body fluid infections. In our
study this was varied and the reason may be because of females in this region were more vulnerable to gynecological problems leading to high urine, vaginal or cervical infections.

There were varieties of bacteria isolated from various types of samples in the study. *E. coli* was the most common pathogen among gram negative bacteria. There are some studies that support our finding by stating that *E. coli* is the organisms that can be transferred from one person to another with poor hygiene habits. Another reason of its prevalence in the region of Nawanshahr could be that the people of this area may be in contact with this pathogen by consumption of unpasteurized milk, unpurified water. As almost districts of Punjab are comprised of rural areas, the tendency of unaware people to involve in activities like bathing in ponds of the village, where there may be bowel movement of human or animals may occur is more, may also be a reason of *E. coli* being the most common GNB in all infections.

*Klebsiella* isolation among all GNB was 3rd in all samples after *Pseudomonas*, leading to the idea directly that Nawanshahr is also not spared from the nosocomian or community acquired infections. Maximum of the *Klebsiella* *spp.* were found in urine infections that could be due to the ubiquitous nature of bacteria that can infect patients. Moreover the trend was changed in males where maximum no. of the *spp.* was found in pus while in females the *spp.* was isolated from urine in maximum number. The study is accordance to the study by Miftodeet *et al.*, where *Klebsiella* was found to be prevailing organism causing UTI’s (Miftodeet *et al.*, 2008).

Like many other studies, Enterobacter infections in hospital are prevailing in Nawanshahr also (Hidronet *et al.*, 2008; Fox, 2013). The isolates were mainly found in urine samples in both males and females. Because of catheterization or other urinary procedures, that tends the patient to get infected with nosocomian microorganisms. Our study lies with the study by Ritchie *et al* where also almost all types of samples isolated Enterobacter *spp.* as a result of nosocomian infections mainly (Ritchie *et al.*, 2009).

Among other GNB’s *Citrobacter* *spp.* were also found. But the frequency of the theses isolates was lesser. The presence of *Citrobacter* in clinical samples is considered to be as rare opportunistic infection. That is inaccordance to the study by Knirelet *et al* (Knirelet *et al.*, 2002). The presence of bacteria in females was more that may be due to the biologically and physically prone nature of females to get almost all infections earlier than males.
Pseudomonas, the nosocomian bug was found to be 2nd common isolate in causing infections after E. coli. As it is known that this bacterium is widely distributed in environment, the chances of its infection in hospitals as well as community were expected to be higher. According to our observation in the study there was no difference between the number of female and male patients infections. That may be due to the reason that pseudomonas is so prevalent everywhere and it chances and mode of infections i.e., burn patients, catheterization, swimming are common to infect both genders. According to our results, The most common infection by this isolate was found to be in urine samples which lies with study by Bitsori et al (Bitsori et al., 2012). According to the present scenario the Pseudomonal infections are getting higher in community and need to be the matter of concern.

Another GNB, Acinatobacter spp. were also prevalent in the study that may be due to the population here with weaker immune systems due to diabetes or AIDS or conditions like organ transplant or neutropenia. The diverse mechanisms used by this bacteria to survive and resistance has emerged this pathogen in environment. That lies with study by Lolans et al, which also showed emergence of the bacteria worldwide (Lolans et al., 2006). Females were found to be more prone to infections because it is an opportunistic pathogen, and can infect the female patients easily than males. The study is in accordance to Mai et al (Mai et al., 2013).

Proteus spp. was found to be very less in number among other gram negative bacilli. Male patients reported more infections by this bacterium than female patients. The most of the infections by this bacterium were in pus samples. The reason of this could be the nature of this bacteria getting colonized on skin and wounds and our study lies with the study Mordi and Momoh, where also Proteus spp. were most commonly found in skin and wound infections (Mordi and Momh, 2008).

Appearance of gram positive cocci i.e., Staphylococcus aureus and Enterococcus spp. was maximum in all types of cultures in both sexes. These bacteria are considered to be as one of the other most important infectious agents in humans that cause mild to severe diseases. The study lies in accordance to the study by Jamal et al (Jamal et al., 2011). These bacteria are considered to be important because of its presence in community as well as in hospitals. The rise in the incidence of these bacteria may be due to the rise in its resistance to antibiotics, which makes the increased survival of these bacteria, which makes it potent for causing more infections.
According to the antibiotics tested, there was no single bacterium that was sensitive to all the antibiotics tested. The antibiotics that were considered to be as sensitive at once have now become resistant like Penicillin, amoxicillin-Clavulinic acid, Cefotaxime, Ceftazidime, cefaparazonesulbactemn, piperacillin tazobactem, and ampicillin. The isolates were sensitive to linezolid, polymixin B, Colistin, in which these antibiotics were tested. There were few bacteria that were resistant to Vancomycin, gentamicin, Gatifloxacin and Nitrofurantoin. Though in other studies, all the isolates were resistant to erythromycin, but in our study the antibiotic was seen resistant to few of the bacteria. From which we can confer that the antibiotic can be used in the region after testing susceptibility. According to the study the antibiotics Penicillin, Ampicillin should not be used for treatment in particular region. The study confers that almost all basic antibiotics have got resistant by bacteria and the pathogens in this region are sensitive only to higher antibiotics, which makes the situation of antibiotic susceptibility an alarming condition.

Among gram positives, bacteria, Staphylococcus aureus and Enterococcus spp. were resistant to penicillin 100%. Whereas in case of ampicillin the resistance pattern was different for both. Here Staphylococcus aureus was lesser resistant than Enterococcus spp. According to the report by BC center of Disease control, UK, bacteria were sensitive to ampicillin highly but in our study ampicillin is resistant in 100% cases, indicating the varied trend of the bacteria in variable regions which should always be at check. The reason of this could be the prevalence of resistant genes in the region (stosoret et al., 1998).

In GNB’s like, Klebsiella spp., E.coli, Citrobacter and in which Ampicillin was tested, showed 100% resistant, which is again alarming because according to the data, in other parts of the world there are sensitive E.coli strains to Ampicillin. Moderate levels of resistance have been seen for Amikacin, Aztreonam and Erythromycin. The resistance to Cotrimoxazole was seen slightly high as compared to other studies. Nitrofurantoin, The antibiotic that was considered to be empiric treatment for uncomplicated UTI infection was seen resistance in our study. The antibiotics tested among Proteus spp. the resistant trends were slightly lower than Klebsiella spp and E.coli. (Bahashwan and Shafey, 2013).

The trends of resistance by Enterobacter were changed from rest of the bacteria. Few isolates of the bacteria were sensitive to Ceftazidime, whereas E.coli and Klebsiella were 100% resistant. Gentamicin resistance was also very low as compared to other GNB’s. Though other GNB’s were
sensitive to Amikacin, maximum strains of Enterobacter spp. were resistant to it. Acinetobacter showed 100% resistance to all of the isolates the finding lies with the finding of Aibinuet al (Aibinuet al., 2003).

Pseudomonas spp. was resistant to almost antibiotics except Neltymycin, Aztreonam and ciprofloxacin. Another study also showed the antibiotics appropriate to treat the pseudomonal infections (Livermore, 2006).

In gram +ve bacteria, Enterococcus spp and Staphylococcus aureus showed almost same resistance patterns expect few of antibiotics. Both were resistant to penicillin and amoxicillin-Clavulenic acid. Staphylococcus aureus isolates were moderately sensitive to Ampicillin. The finding is in accordance to the findings by Livermore (Livermore, 2000). Though Amikacin was seen sensitive in many isolates in both of the bacteria, Staphylococcus were more sensitive to the antibiotic. Same happened in case of erythromycin, where both the bacteria were sensitive in which, more of the isolates of Enterococcus were sensitive to Erythromycin. The results for Cotrimoxazole were different in both isolates. The Staphylococcus isolates were resistant in more than 50% of cases whereas, almost all Enterococcus spp. were sensitive to the antibiotic. Though many of the studies show Cotrimoxazole sensitive to staphylococcus aureus, in our study the number of resistance was moderately high Schweizer (Schweizer et al., 2014).

There have been a very high rates of antibiotic resistance studied worldwide (plate 20). Similar results were recorded in our study too. In case of antibiotics resistance, bacteria were found completely resistant to Penicillin G in both males and females. However, the resistance towards ampicillin was also very high except approximately 2% of females. Since these antibiotics were the oldest discovered antibiotics and many literatures have shown the occurrence of penicillin resistance genes globally, our study reports that Nawanshahr is also not spared from the prevalence of these resistance genes. The finding is in accordance to the findings by Livermore (Livermore, 2000).

In our study, the causative isolates of bacteria were resistant to ampicillin in approximately 90% of cases. In this, isolates from male patients were almost resistant to ampicillin. Isolates from female patients showed low resistant rates comparatively. According to our study, from the samples of male patients, Enterobacter isolates were sensitive to this antibiotic, whereas in
females the resistance by Enterobacter was 100%. However the resistance to ampicillin by other
bacteria was 100%, which is a matter of concern but in females there were few isolates that were
moderately sensitive to ampicillin like Pseudomonas, Staphylococcus aureus. Few isolates of
E.coli also showed sensitivity towards ampicillin. The finding is in accordance to the findings by
Livermore (Livermore, 2000).

The overall resistance to Cefotaxime was also high by all isolates in both genders. Here again,
the isolates from male patients showed higher resistance to Cefotaxime as compared to females.
In males all isolates except Enterobacter (little sensitive) and E.coli showed sensitivity to
Cefotaxime, whereas in females the resistance was lower than of males. In females,
Pseudomonas, and Enterobacter were sensitive to the antibiotics in 50% of cases. E.coli and
Citrobacter also showed sensitivity to an extent. Our study lies with the study by Ritchie et al
where also almost all types of samples isolated Enterobacter spp. as a result of nosocomian
infections mainly were resistant to antibiotics (Ritchie et al., 2009).

For the antibiotic Ceftazidime, all isolates in males again were resistant in up to 90% of cases.
However, in females the resistance rates were around 80%. E.coli was moderately sensitive to
the particular antibiotic and Enterobacter and Proteus too showed sensitivity to an extent. In
females, Enterobacter showed 100% resistance. Pseudomonas isolates were sensitive in 50% of
cases. Other isolates like E.coli, Citrobacter and Klebsiella were too sensitive to Ceftazidime to
an extent. Our study lies with the study by Ritchie and coworkers where also almost all types of
samples isolated Enterobacter spp. as a result of nosocomian infections mainly (Ritchie et al.,
2009).

The resistance rate of Ceftriaxone was very low as compared to other antibiotics. This was one
of the antibiotics that showed high sensitivity in all isolates in males as compared to females. All
isolates were sensitive to this antibiotic in males except few isolates of Enterobacter, E. coli, and
Proteus. Out of these, E.coli was most resistant whereas in females the most resistant isolates
were of Proteus. Enterobacter isolates were least resistant in both sexes. Our study lies with the
study by Ritchie et al where also almost all types of samples isolated Enterobacter spp. as a
result of nosocomian infections mainly (Ritchie et al., 2009).
Almost all GNB’s were resistant to Cefaparazone-Sulbactem and the resistance rates were almost similar in both sexes. Pseudomonas and Proteus were isolates that showed a degree of sensitivity to this antibiotic. Rest of the antibiotics in both genders were more than 80% resistant to the particular antibiotic. The results lie with the study by Jacoby (Jacoby, 2009). Our findings vary from the findings by Lister et al., which showed almost isolates of Pseudomonas were resistant to Cefaparazone-Sulbactem (Lister et al., 2009). From this we can confer that the global distribution of these resistance genes has not involved Nawanshahr yet, so our isolated pathogens are still sensitive to the antibiotic. The usage of this antibiotic wisely can spare this antibiotic from microbial resistance for long.

The resistance of isolates to Piperacillin-Tazobactem was also high, but the rate in percentage was quite different in both sexes. Isolates in Males were resistant in almost 88% of cases whereas, the bacteria that were isolated from females were resistant in approximately 72% of cases. In isolates from males, only E.coli and Proteus were sensitive to the antibiotic. However, in females few isolates of many bacteria were sensitive to Piperacillin-Tazobactem. Among them isolates of Pseudomonas, E.coli, Klebsiella, Citrobacter and Proteus are reported. The results lie with study of Anthony et al (Anthony et al., 2002).

The isolates were almost sensitive to gentamycin. Here the isolates from male patients were less resistant as compared to the isolates from female patients. In males, gentamycin was insensitive to isolates of Proteus and E.coli and Proteus to an extent, whereas in females, 50% of Pseudomonas case was resistant to gentamycin. Except of all isolates of Enterococcus in females, all other isolates were resistant to variable extent. All isolates of Enterococcus in both males and females were sensitive to gentamycin; conferring to the results that gentamycin is the most appropriate drug for treating enterococcal infections in both males and females in Nawanshahr region of Punjab.

The isolates were though sensitive to Amikacin but there were many isolates from female patients that were resistant to it. The resistant rate in males was very low as compared to females. In spite of low resistance rates, the isolates of Enterobacter, Citrobacter and Enterococcus in males were completely resistant in males. This leaves the idea of not using this antibiotic in males while treating these bacterial infections. However, in females, only 25% Enterococcus were resistant to Amikacin, Staphylococcus isolates were almost sensitive to it. In females a little
less, more than 90% of Enterobacter isolates were resistant to Amikacin, leaving the ineffectiveness of Amikacin in Enterobacter isolates in both sexes. The results interpreted from the study of Lister et al (Lister et al., 2009) where Pseudomonas was considered least effective by being more than 20% resistant. According to Lister et al, Amikacin was chosen as effective antibiotic, but in our study Amikacin too was found resistant by Enterococcus isolates, are taken to be as very resistant to antibiotics or gets resistant during therapy, which is a reported global problem (Ritchie et al., 2009).

The isolates from both genders were quite sensitive to erythromycin, whereas the resistance rate in both sexes was different. In males the resistance rates were observed in percentage. This was seen resistant in only staphylococcus aureus isolates, rest of the isolate were sensitive to erythromycin. Whereas in females, Klebsiella was 100% resistant to erythromycin and E.coli too showed high rates to erythromycin in females, leaving the interpretation that in females, GNB’s isolated were more resistant to Erythromycin as compared to males, where only GPC’s were seen resistant. The results lie with stock and Wiedemann (stock and Wiedemann, 2001). According to this study, Klebsiella are naturally resistant to erythromycin, which was also seen in our study.

The resistance to clindamycin by all isolates was very low. Almost isolates were sensitive to the antibiotic. The only isolate that was 100% resistant to clindamycin was Proteus in both genders. However the resistance rates in both sexes overall too was similar for this antibiotic. In females, Klebsiella isolates were completely resistant to clindamycin. The results lie with stock and Wiedemann (stock and Wiedemann, 2001) one open randomized comparative study in Post-partum endomyometriumitis patients, also showed clindamycin resistance (Martens et al., 1990).

The resistance rate of ciprofloxacin though was average but in both genders the rates were quite different. The isolates from males were very sensitive to ciprofloxacin as compared to females, where more than 66% of isolates were not sensitive to the antimicrobials. The Enterococcus isolates were very sensitive to the antibiotic in males, whereas in females the resistance by Enterococcus was 100%. According to a study conducted on male patients with complicated UTI’s in Korea, reported that ciprofloxacin should not further be used for males in treating Enterococcus infections, however according to our study the antibiotic was effective in males than females, the reason behind this could be that in Korea the sub tropic or humid environment
provides lavish chances to Enterococcus to grow, which in turn makes the Enterococcus more resistant to antibiotics there, thus lesser resistance seen in this region of Punjab in males (Lee, 2013)

The resistance by isolated pathogens to imipenem was though average but was variable again in both genders. The female patients were highly resistant to imipenem, whereas the isolate from males were almost sensitive to the antibiotic (Dizbay et al., 2010).

The resistance to tetracycline was tested in isolates was very low. Almost all isolates that were tested were sensitive to tetracycline in both genders, confirming to the idea that this antibiotic still can be used for treating gram positive infections (Dizbay et al., 2010).

The isolates were also found resistant to Cotrimoxazole in the study. But the males in the study were found to be more resistant to Cotrimoxazole as compared to females’ overall. When compared Pseudomonas isolates in females were around 50% resistant to the antibiotic and in males it was approximately 90%. Acinatobacter in both genders was completely resistant to the antibiotic. The results lie with studies by Dizbay et al (Dizbay et al., 2010).

According to the results of the study, Nitrofurantoin is now become of no more use in urine infections mainly. The resistance rates have shown the isolates with high resistance to this antibiotic. The male have shown very high resistance towards this antibiotic, whereas, females are still sensitive to it. In females except Enterococcus and Pseudomonas, all other isolates were near about 90% resistant to the antibiotic. However in males, there was not a single isolate that was sensitive to the antibiotic, all were resistant to the antibiotic in up to 80% of cases. Which suggests that Nitrofurantoin treatment that is an empiric treatment in UTI, should be replaced with any other antibiotic in males especially. However there is not sufficient data on Nitrofurantoin susceptibility in UTI’s, but The results lie with the studies by Livermore et al (Livermore et al., 2011). The present study also presents a gender perspective on community acquired infectious diseases. The evidence of the clear differences in the microbial disease processes between females and males should also be discussed, however, how, such differences between male and female, it can help to improve the progression of the treatment and outcome of infections. This understanding the fundamental evidences in men and women in terms of infections will aid in the detection/ diagnosis and treatment. This may increase role of lay people
in and the implementation and effectiveness of prevention and control activities, which was the one of the purposes of this study. Biological differences i.e. sex/gender between males and females are the basic reason to arise because of gender differences. Thus as one consequence of the gender-based nature i.e., behavior and power leads to various duties and responsibilities among both sexes. Generally the terms sex and gender are used in writing, without considering the difference between words. By and large, the word gender refers to differences between males and females on account of social and cultural factors whereas the word sex refers to anatomical and physiological difference between males and females. However, that although the difference between these two points is noteworthy, but it is not possible to know the attribution on differences in infection processes independently to either gender or sex. Though there is a potential significance of differences in both terms; gender and sex for the transmission, progression and outcome of few infections, a little information is on hand about the implication of gender and sex for the surveillance of and response to infections.

Despite a lot of work on sex and gender relationships in infections, there has always been a lack on the point of gender or sex wise spread of infections. Those who studied about these realtionships, worked in isolation with variety of disciplines vis a vis. epidemiology, medical or biological sciences, social sciences or demographic studies. There may be a reason that the studies done in isolation to each subject could be a barrier to the implementation of research in infection control and management. There must be a collection of findings from various disciplines so that they can be used as an informative data for infection control. There must be a clear review about the interrelationships among sex, gender and infections. Linezolid, Vancomycin, Polimixin B, Colistin, Teicolanin, Gatifloxacin were the antibiotics that were studied as most effective antibiotics as no isolate was seen resistant against these antibiotics in both genders. However in females a few isolates were resistant to Gatifloxacin and Vancomycin. A few isolates of Enterococcus species were found resistant to Gatifloxacin in females and few isolates of E.coli were reported as resistant to Vancomycin in females. Rest of the isolates was all sensitive to these antibiotics. These are the potent antimicrobial agents that are used in complicated infections globally, also showed good sensitivity here. The results lie with the studies by GU et al (GU et al., 2013).