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SURVEY ON USE OF NON PRESCRIBED ANTIBIOTICS FOR POPULATION IN SATARA CITY

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ABSTRACT

The word “antibiotic” is used to describe a chemical substance derivable from a microorganism or produced by chemical synthesis that kills or inhibits microorganisms and cures infections. The main aim behind this survey was to find out sale of antibiotics without prescription. The non prescription antibiotics may causes severe side effects in the patients. The study on use of non-prescribed antibiotics amongst people was conducted in Satara city. The questionnaire was developed and distributed to various medical shops. After returning to the questionnaire it showed various outcomes. From outcomes, graph results and conclusions were prepared. From those conclusions, it was suggested that, there is need of more awareness about the use of antibiotics amongst the surroundings.

INTRODUCTION

The word “antibiotic” is used to describe a chemical substance derivable from a microorganism or produced by chemical synthesis that kills or inhibits microorganisms and cures infections. The noun “antibiotic” was first used in 1942 by Dr. Selman A. Waksman, soil microbiologist. Dr. Waksman and his colleagues discovered several actinomycetes derived antibiotics.

The increase in life expectancy seen during the twentieth century in many parts of the world is by now too familiar to require lengthy discussion. Expectancy at birth in the United States, for example, increased by close to two decades from 49.2 years at the beginning of that century to 68.1 years in 1950. This remarkable jump generally has been attributed to improvements in sanitation and the advent of drugs for the treatment of infectious disease. Many bacterial infections that required hospitalization before World War II are now treated with a course of antibiotics. Usage is so well accepted that treatment will involve prescription called into the pharmacy by the physician’s office and self-administration at home. The isolation of pure penicillin in 1939 in England is often used to date the beginning of the development that has led to today’s armamentarium of antibiotics drugs. However, the story in fact begins back in Germany in the early 1930s.^[1]

Mechanism of Action:

Antibiotics operate by inhibiting crucial life sustaining processes in the organism

- Bacterial cell wall synthesis.
- Bacterial protein synthesis.
- Nucleic acid synthesis.
- Membrane function.
- Metabolism.

The target of the antibiotic should be selective to minimize toxicity still all antibiotics are toxic to some degree.^[1,2]

Uses of antibiotics:

Antibiotics are used in medicine to treat diseases that are caused by bacteria, while some are also effective against fungi and protozoa. The majority of bacteria are harmless to human body but the rest of them are pathogenic and responsible for numerous diseases and infections throughout the world, many of which are still fatal in some parts of the world. The pandemic of bubonic plague that was caused by bacterium *Yersinia pestis* caused about 70 millions of deaths worldwide.

Bacterial infections can be treated with antibiotics which either eliminate the bacteria (bactericidal) or inhibit their growth (bacteriostatic). There are many different types of antibiotics

which are used for treatment of diseases caused by bacteria which also distinguish themselves by the effective range. Antibiotics that eliminate or block the growth of particular bacteria are commonly referred as the narrow-spectrum antibiotics, while antibiotics which target wider range of bacteria are known as broad-spectrum antibiotics.

Besides humans bacteria also affect animal and plants. For that reason antibiotics are besides in medicine for treatment of bacterial infections also used in agriculture to treat or prevent diseases of animals and plants that greatly contributed to the resistance of bacteria against some prescribed antibiotics in humans.^[3]

Pharmacokinetics:

Pharmacokinetics (PK) is the study of drug deposition in the body. PK studies usually measure the time course of drug concentrations in the body or (especially with antibiotics) the delivery of a drug to extra vascular sites where infection sometimes takes place.

Three primary PK measures are determined:

- Peak, or maximum, concentration (C_{\max})
- Half-life ($t_{1/2}$), which is inversely proportional to the rate of elimination
- Area under the concentration–time curve (AUC), which is the product of serum concentration values and time

Adverse Drug Reaction:

Each year many patients are hospitalized with adverse drug reactions. Life-threatening reactions include arrhythmias, hepatotoxicity, acute renal failure, and antiretroviral therapy–induced lactic acidosis. In addition, during the latter half of the twentieth century 6% to 7% of hospitalized patients experienced a serious adverse drug reaction.

Adverse reactions associated with drug use include allergies, toxicities, and side effects. An allergy is a hypersensitivity reaction to a drug. Many are IgE-mediated and occur soon after drug administration. Non–IgE-mediated reactions include hemolytic anemia, thrombocytopenia, acute interstitial nephritis, serum sickness, vasculitis, erythema multiforme, Stevens-Johnson syndrome, and toxic epidermal necrolysis. Toxicity, which is generally due to either excessive dosing or impaired drug metabolism, is a consequence of administering a drug in quantities exceeding those capable of being physiologically “managed” by the host. Examples of toxicity caused by excessive dosing include penicillin-related neurotoxicity (e.g., twitching, seizures) and the toxicities caused by aminoglycosides. Decreased drug metabolism or clearance may be due to impaired hepatic or renal function. For example, penicillin G neurotoxicity may be precipitated by aminoglycoside induced renal failure. Side effects include adverse reactions that are neither

immunologically mediated nor related to toxic levels of the drug. An example is the dyspepsia caused by erythromycin.

Drug Interaction:

Antibiotics can either be the precipitant or the object of a drug interaction. Interactions can be beneficial or harmful. Several antibiotics are marketed as fixed combinations of two or more antibacterial agents. Trimethoprim-sulfamethoxazole is a combination of two antibacterials that synergistically inhibit microbial growth by blocking bacterial folic acid synthesis. Clinicians often administer multiple antibiotics concurrently, especially in critically ill patients. In patients with polymicrobial infections, multiple antibiotics are sometimes needed to exert activity against multiple pathogens with markedly different antibiotic susceptibility profiles. Combination antibiotic therapy is most commonly used in life-threatening infections to increase the likelihood that “broad spectrum” empiric therapy includes a drug active against the unknown pathogen.

Some toxic antibiotic drug interactions are pharmacodynamics in origin, resulting from the administration of multiple drugs with overlapping toxicities. Combining antibiotics and other drugs (e.g., amiodarone, haloperidol, diltiazem) that prolong the Q-T interval can lead to death.

Administration of Antibiotics:

Oral antibacterials are orally ingested, whereas intravenous administration may be used in more serious cases such as deep-seated systemic infections. Antibiotics may also sometimes be administered topically, as with eye drops or ointments.

Antibiotic Resistance:

Antibiotic resistance is a type of drug resistance where a microorganism is able to survive upon exposure to an antibiotic. A spontaneous or induced genetic mutation in bacteria may confer resistance to antimicrobial drugs; genes that confer resistance can be transferred between bacteria in a horizontal fashion by conjugation, transduction, or transformation. Thus, a gene for antibiotic resistance that evolves via natural selection may be shared. Evolutionary stress such as exposure to antibiotics then selects for the antibiotic resistant trait. Many antibiotic resistance genes reside on plasmids, facilitating their transfer. If a bacterium carries several resistance genes, it is called multidrug resistant (MDR) or, informally, a superbug or super bacterium.

The increasing prevalence of antibiotic-resistant bacterial infections seen in clinical practice stems from antibiotic use both within human medicine and veterinary medicine. Any use of antibiotics can increase selective pressure in a population of bacteria to allow the resistant bacteria to thrive and the susceptible bacteria to die off. As resistance towards antibiotics becomes more common, a greater need for alternative treatments arises. However, despite a push for new antibiotic therapies

there has been a continued decline in the number of newly approved drugs. Antibiotic resistance therefore poses a significant problem.

The four main mechanisms by which microorganisms exhibit resistance to antimicrobials are:

1. Drug inactivation or modification: for example, enzymatic deactivation of penicillin G in some penicillin-resistant bacteria through the production of β -lactamases
2. Alteration of target site: for example, alteration of Penicillin binding proteins—the binding target site of penicillins in Methicillin resistant *Staphylococcus aureus* and other penicillin-resistant bacteria
3. Alteration of metabolic pathway: for example, some sulfonamide-resistant bacteria do not require para-aminobenzoic acid (PABA), an important precursor for the synthesis of folic acid and nucleic acids in bacteria inhibited by sulfonamides, instead, like mammalian cells, they turn to using preformed folic acid.
4. Reduced drug accumulation: by decreasing drug permeability and/or increasing active efflux (pumping out) of the drugs across the cell surface.

Misuse of Antibiotics:

Inappropriate antibacterial treatment and overuse of antibiotics have contributed to the emergence of antibacterial-resistant bacteria. Self prescription of antibacterials is an example of misuse. Many antibacterials are frequently prescribed to treat symptoms or diseases that do not respond to antibacterial therapy or are likely to resolve without treatment, or incorrect or suboptimal antibacterials are prescribed for certain bacterial infections. The overuses of antibacterials, like penicillin and erythromycin, have been associated with emerging antibacterial resistance since 1950s. Widespread usage of antibacterial drugs in hospitals has also been associated with increase in bacterial strains and species that no longer respond to treatment with the most common antibacterials.

Common forms of antibacterial misuse include excessive use of prophylactic antibiotics in travelers and failure of medical professionals to prescribe the correct dosage of antibacterials on the basis of the patient's weight and history of prior use. Other forms of misuse include failure to take the entire prescribed course of the antibacterial, incorrect dosage and administration, or failure to rest for sufficient recovery. Inappropriate antibacterial treatment, for example, is the prescription of antibacterials to treat viral infections such as the common cold.^[4]

Classification of Antibiotics:^[2]**I. Classification on the basis of biological effect:**

- a) **According to spectrum:** i.e. number of organisms affected by the same antibiotic.
- Broad spectrum
 - Narrow spectrum
- b) **Classification according to the route of administration:**
- Oral: Given by mouth.
 - Injection: to give rapid onset of action and quick presence of the antibiotic in the blood stream (e.g.: Post operation).
 - Topical application: superficial inflammation (more powerful).
- c) **Classification according to the type of action of antibiotic:**
- Bactericidal: To virulent microorganism to omit the problem from the root.
 - Bacteriostatic: Slow down the growth and give chance to the body immune response to fight the pathogen.

II. Classification according to chemical structures

Basic principles of chemical classification:

- Compounds of similar structures have similar biological activity.
- Biological activity is frequently due to a structure moieties as $-\text{CO}-\text{C} = \text{X}$ where X is CH_2 or N_2 or COOH

1. Primary Classification:

According to Berdy (1974), antibiotics are arranged into families include the following:

- Carbohydrate- antibiotics: Antimicrobial containing sugars
- Macrocyclic lactone and Quinone.
- Amino acid and peptide antibiotics.
- Heterocyclic antibiotics. (Nitrogen and oxygen containing).
- Alicyclic antibiotics (have an aromatic ring)
- Aliphatic antibiotics.

2. Secondary classification:

Within each family, the antibiotics are placed into subgroups according to the following:

- Antibiotic with single or several characteristics.
- Size of the molecule.
- Similar or different skeleton.
- Antibiotics with practical importance.

- Specific type of linkage or chromophore.
- Similarities.
- Biological activities.
- Carbohydrate antibiotics

This family is classified into 4 subfamilies

- Pure saccharine's
- Amino glycosides
- Other N or C- glycosides
- Various sugar derivatives

Classification on Chemical Structure:

The most useful is based on chemical structure. Antibiotics within a structural class will generally show similar patterns of effectiveness, toxicity, and allergic potential.

β – Lactam:

Penicillin:

The penicillins are the oldest class of antibiotics, and have a common chemical structure which they share with the cephalosporins. The two groups are classed as the beta-lactam antibiotics, and are generally bactericidal—that is, they kill bacteria rather than inhibiting growth. The penicillins can be further subdivided. The natural penicillins are based on the original penicillin G structure; penicillinase-resistant penicillins, notably methicillin and oxacillin, are active even in the presence of the bacterial enzyme that inactivates most natural penicillins. Aminopenicillins such as ampicillin and amoxicillin have an extended spectrum of action compared with the natural penicillins; extended spectrum penicillins are effective against a wider range of bacteria. These generally include coverage for Pseudomonas aeruginosa and may provide the penicillin in combination with a penicillinase inhibitor.

Cephalosporins:

Cephalosporins and the closely related cephamycins and carbapenems, like the penicillins, contain a beta-lactam chemical structure. Consequently, there are patterns of cross-resistance and cross-allergenicity among the drugs in these classes. The "cepha" drugs are among the most diverse classes of antibiotics, and are themselves sub grouped into 1st, 2nd and 3rd generations. Each generation has a broader spectrum of activity than the one before. In addition, cefoxitin, a cephamycin, is highly active against anaerobic bacteria, which offers utility in treatment of abdominal infections. The 3rd generation drugs, cefotaxime, ceftizoxime, ceftriaxone and others,

cross the blood-brain barrier and may be used to treat meningitis and encephalitis. Cephalosporins are the usually preferred agents for surgical prophylaxis.

Fluroquinolones:

The fluroquinolones are synthetic antibacterial agents, and not derived from bacteria. They are included here because they can be readily interchanged with traditional antibiotics. Earlier, related classes of antibacterial agents, the quinolones, werenot well absorbed, and could be used only to treat urinary tract infections. The fluroquinolones, which are based on the older group, are broad-spectrum bactericidal drugs that are chemically unrelated to the penicillins or the cephalosporins. They are well distributed into bone tissue, and so well absorbed that in general they are as effective by the oral route as by intravenous infusion.

Tetracyclines:

Tetracyclines got their name because they share a chemical structure that has four rings. They are derived from a species of *Streptomyces*. Broad-spectrum bacteriostatic agents, the tetracyclines may be effective against a wide variety of microorganisms, including rickettsia and amebic parasites.

Macrolides:

The macrolide antibiotics are derived from *Streptomyces* bacteria, and got their name because they all have a macrocyclic lactone chemical structure. Erythromycin, the prototype of this class, has a spectrum and use similar to penicillin. Newer members of the group, azithromycin and clarithromycin, are particularly useful for their high level of lung penetration. Clarithromycin has been widely used to treat *Helicobacter pylori* infections, the cause of stomach ulcers.

Others:

Other classes of antibiotics include the aminoglycosides, which are particularly useful for their effectiveness in treating *Pseudomonas aeruginosa* infections; the lincosamides, clindamycin and lincomycin, which are highly active against anaerobic pathogens. There are other, individual drugs which may have utility in specific infections.^[5]

METHODOLOGY

Question

- Name of medical store:- _____
- Address: _____
- **Questions:**
 - 1) Are you selling antibiotics without prescription?
 - 2) For which symptoms usually you are giving antibiotics?

- 3) What is the age group of patient who frequently ask for antibiotics?
- 4) Do you sell antibiotics for children? If yes then which are these antibiotics?
- 5) Which antibiotics are you using for adult patients?
- 6) Do you provide information regarding misuse of antibiotics?
- 7) Which is the most popular brand among them?
- 8) How many people in a day ask you for antibiotic without prescription?
- 9) Do you feel that now a day's first generation antibiotics are not being used by patients?
- 10) Are patients demand newer i.e. third generation antibiotics?

RESULTS

During study on use of non-prescribed antibiotics in people at Satara city, the medical shop was selected for survey. Out of 60,55 were returned from various medical shops. It was found that,15 pharmacists gave response and they were selling antibiotics without prescription. Customer acceptability towards antibiotics may be due to the fast onset of action and satisfaction. The cephalosporin type of antibiotic is mostly sale in Satara city. This may due to its better results.

The 55 medical shops showed various results which are,

Table No.1: Discussion Point

Sr. No.	Discussion Point	No. of people in responses (Yes)	No. of people in responses (No)
1.	Selling antibiotics without prescription	15	33
2.	Selling antibiotics for children	22	33
3.	Consultation by pharmacist to patient regarding misuse of antibiotics	37	18
4.	People asking about antibiotics without prescription	26	29

Table No.2: Type of Antibiotic

Sr. No.	Type of Antibiotic	No. of more Dispensed Antibiotics
1.	Fluroquinolones	6
2.	Macrolide antibiotics	6
3.	β -lactum antibiotics	10
4.	Cephalosporin	34

Table No.3:Age Group of patient who frequently asks for antibiotics

Sr.No.	Age Group of Patient Who Frequently Asks For Antibiotics	NO.OF PEOPLE
1.	10-20	6
2.	20-30	10
3.	30-40	16
4.	40-50	17
5.	50-60	9
6.	60-70	4

Out of 60, 55 were returned. In that 72.72%, denied to respond the question, 'Does they sell antibiotic without prescription?'

Amazingly those 27.17% pharmacists were agreed that they sell antibiotic without prescription, primarily for the symptoms like cough, cold, stomach infections. The antibiotics which are commonly sold are Cefixime (60.71%), Amoxicillin (17.85%), Azithromycin (10.71%), and Ciprofloxacin (10.71%).

Also we found that

- 67.27% of pharmacists provide information about misuse of antibiotics.
- 47.27% patients ask for antibiotics over the counter.

The age group between 40 to 50 frequently asks for the antibiotics to the pharmacists.

DISCUSSION

Table 4 shows the percentage against the particular discussion point for Satara City.

Table 5: Dispense of Antibiotics in Satara City

Work investigated about use of antibiotics without prescription among people in Satara region.

Table No.4: Percentage against discussion point

Sr. No.	DISCUSSION POINT	Yes (%)	No (%)
1.	Sale of antibiotics without prescription	27.17	72.72
2.	Sale of antibiotics for children	40	60
3.	Consultation by pharmacists to patients regarding misuse of antibiotics	67.27	32.72
4.	People asking about antibiotics without prescription	47.27	52.72

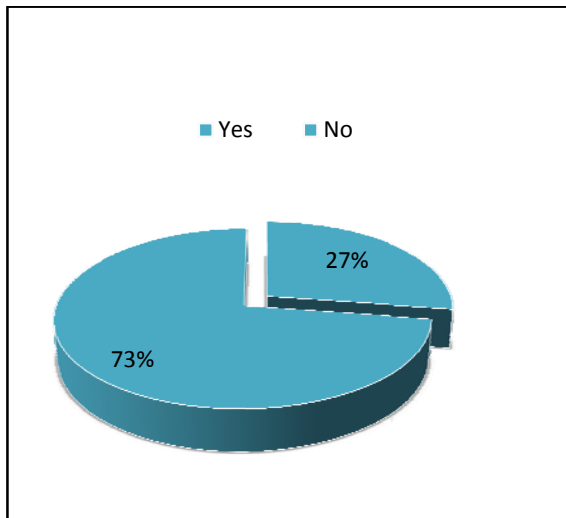


Fig.No.1: Sale of Antibiotics without

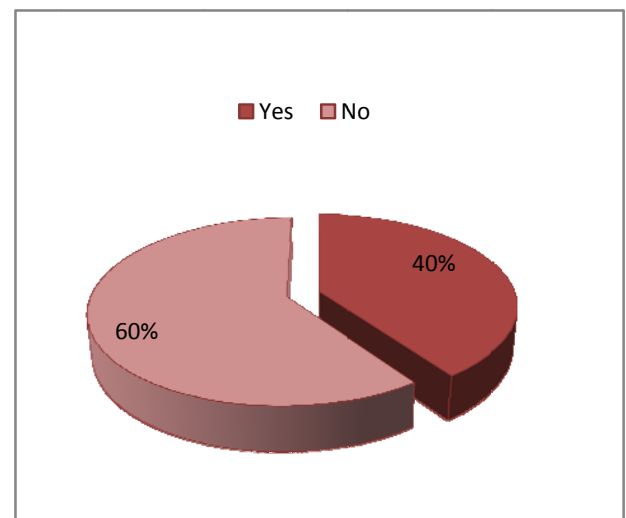


Fig.No.2: Sale of Antibiotics for prescription.

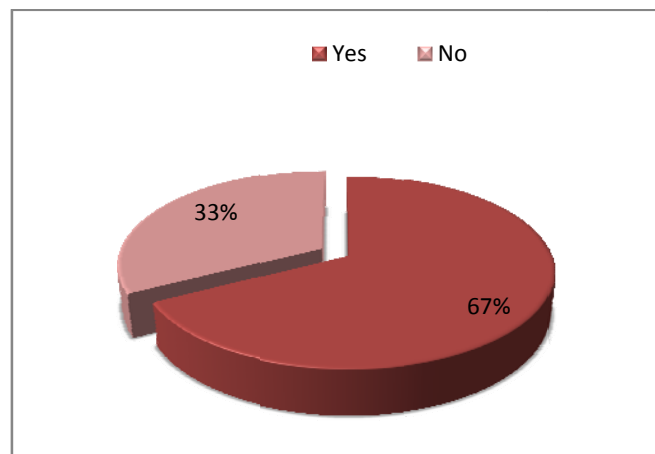


Fig.No.3: Consultation by pharmacists to patients regarding Misuse of Antibiotics

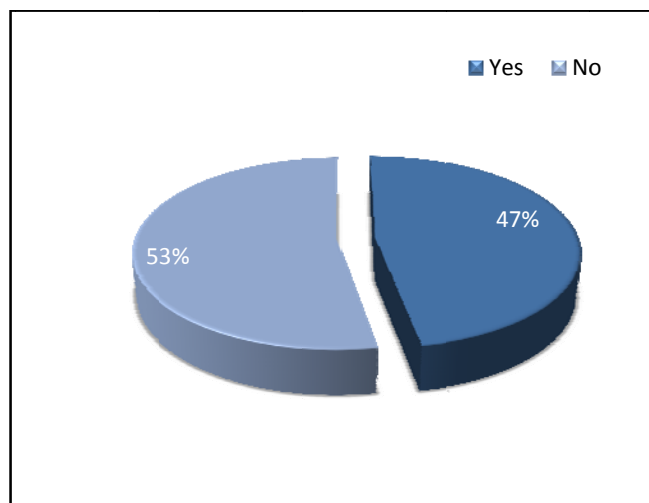


Fig.No.4: % People asking antibiotics without prescription

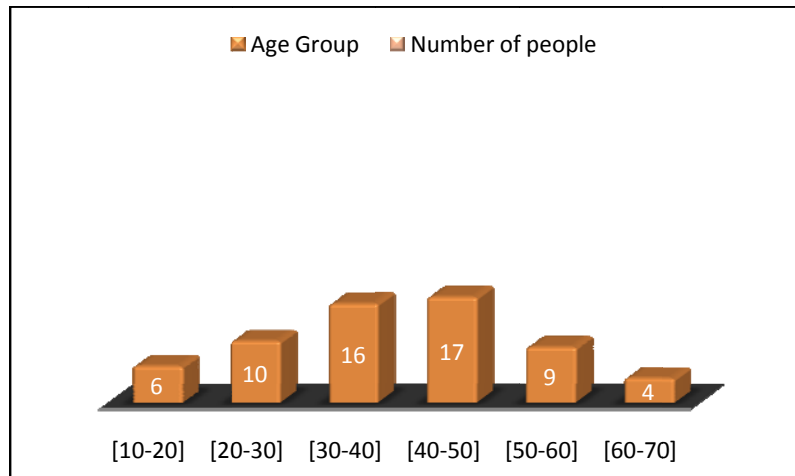


Fig.no.5: Age group of patient who frequently asks for Antibiotics.

More sold antibiotics in percentage by pharmacist:

Table No 5: Dispense of Antibiotics in Satara City.

Sr. No.	Type of antibiotics	% of Patients using antibiotics
1.	Fluroquinolones	10.71
2.	Macrolide	10.71
3.	β – Lactam	17.85
4.	Cephalosporin	60.71

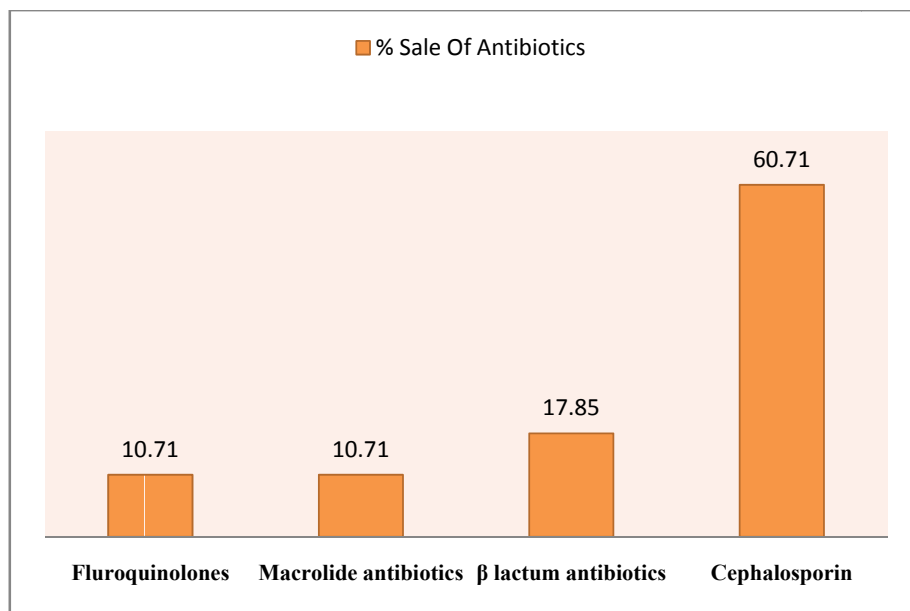


Fig.No.6:% Sale of Antibiotics

CONCLUSION

The prevalence of use of non-prescribed antibiotics in people at Satara city is less, because such use leads to spread of bacterial resistance to the antibiotics and related health problems. Also the customer acceptability towards antibiotics is more because of its better results. So people taking treatment of self-medication due to produce misuse of antibiotics and produce bacterial resistance. Market sale of non-prescribed is more. It is depend on customer acceptability towards antibiotics. So there will be awareness to people which are frequently asks about antibiotics. Do not overuse of antibiotics.

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