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Littering of Unexpended Antibiotics – a Threat to Environment

KEYWORDS: Antibiotic, soil microbiome, environmental threat.

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ABSTRACT *Antibiotic, a potential bioactive substance and a threat to natural environmental systems disseminate either as a result of consumption, excretion, persistence or unsafe disposal. Scientists have documented many adverse effects of unsafe disposal of antibiotics on population of native soil microbiome. Residues of antibiotics have already been reported ranging from few µg to g Kg-1 in soil. In addition to which various antibiotics also occur in soil due to microbes' natural defense mechanism. The overall goal of our study was to investigate inappropriate usage of antibiotics amongst the literate population in the age group of 10 to 50 years. The primary data was collected by survey method in schedule format of fixed sample size. The few parameters included were age, BMI, common ailments, habit of self-medication, commonly used antibiotics, frequency, discontinuation of antibiotics, duration, method used for disposal etc. Since the effect of antibiotic on soil organisms are very diverse inspite of their bioactive properties, preliminary study was conducted to check the impact of commonly used commercially available antibiotic on micro biome of the devised experimental plot. There was a selective pressure of soil microorganisms. Thus the result obtained was an eye opener to study further impact of unexpended antibiotics on soil biome. The result also showed more than 70% of the literate population was still unaware of the proper usage and safe disposal of antibiotics leading to environmental contamination and toxicity. Though many such research and publications were made in view to this topic the status-quo of unsafe disposal in India has to be taken as priority.*

Introduction

Antibiotics are used to treat infections and are an invaluable tool which revolutionized the treatment of infectious disease. Antibiotic resistant pathogens are an emerging, critical human health issue. The World Health Organization (WHO) has declared antibiotic resistance as a top health issue worldwide. The ubiquitous presence of antibiotics has lead to imbalance in microbial ecosystem Significant change has occurred with the large scale human uses of antibiotics because these substances kill off antibiotic susceptible bacteria, and thus create favorable environments for the overgrowth of resistant strains.(Alliance for the prudent use of antibiotics APUA) Persistence of antibiotics in the terrestrial environment is a key factor in determining their adverse environmental impact. Its persistence in the terrestrial environment depends not only on the antibiotic properties but also on the soil properties and weather conditions. Widespread use of antibiotics and their subsequent release into the environment has led to the decreased nitrogen fixing microbial population.

The survey obtained depicts that the most people toss them in the garbage, garden, or flush them down the toilet; but there is a problem with disposing of medication this way. These medicinal compounds might filter into the groundwater, end up in our lakes and streams or remain as residues in the soil affecting indigenous biodiversity of plants and microbiome.

This concern has lead to the emergence of study of littering antibiotics and its adverse effects on plant growth and soil fertility in order to conserve native species and micro flora and fauna.

Design and Methodology:

One hundred individuals between the age group 25-50 years, who are members of M S Ramaiah group of institutions, were asked to complete a structured questionnaire. The members were chosen randomly for the study. Out of 100 structured questionnaires distributed 93 survey reports were eligible and were analyzable for a response rate of 93 %. The majority of respondents were female which helped us in getting information for the entire family. The structured questionnaire was distributed over the range from age, type of antibiotic usage, the method of disposal, the completion of the antibiotic course, the awareness about prescribed antibiotic course, and the impact of the same on the environment (Cliodna et al.,2014).

On a laboratory scale an experimental plot was set up to visually create awareness among the literate group. Antibiotics that were commonly used by the people without prescriptions were prepared at different concentrations that were 1-4 %. The impact of antibiotic on environment was thus measured with respect to that of plant growth and soil microbiome.

Result and discussion: The primary data was collected by survey method in schedule format of fixed sample size. It included 5 major parameters. The respondents were largely from M S Ramaih group of institutions (N=93).the questionnaire was structured based on majorly 4 parameters .33% of the respondents have agreed that they have self medicated themselves at some point of time referring earlier prescriptions or asking the pharmacy tender. 35 % of the respondents also agreed to take the antibiotic without knowing the importance of dosage. 32% of respondents have admitted that frequently same type of antibiotic is taken for same ailment. Alarmingly 67 % of the respondents discontinue the course abruptly with improvement in health. The outcomes of all these four parameters have indicated negative impact in terms of individual health and

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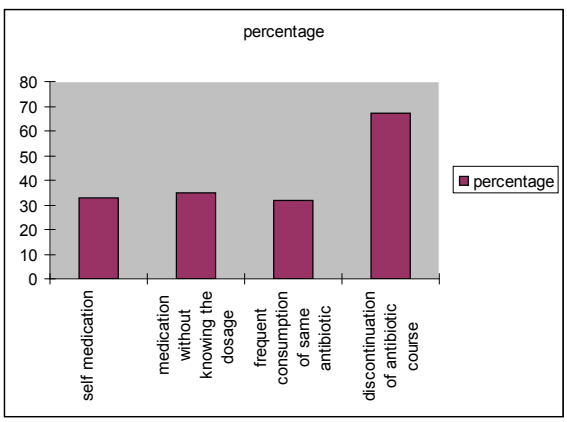
environment. But a personal interaction with respondents in the scheduled format depicted that the considerable amount of awareness persists regarding ones' health but zero percent awareness prevailed regarding the impact that these parameters had on the environment. This called for an exclusive questionnaire on methods of medicine disposal confirming the unawareness regarding the same. The experimental plot proved the negative impact of the antibiotics disposed on the plant growth and soil microbes hence proving the objective of the study.



Conclusion:

Inspite of in depth knowledge of antibiotics amongst the frequent users and with recent trends in medicines very little sect of the population are aware of the impact of these antibiotics on environment. Since antibiotics are natural products it is highly susceptible to microbial attack and degradation in soil but the decomposition is dependent on the type of antibiotic and the characteristic of the soil (winter and willeke 1957). Though there is a positive sign of producing the mutant strains of microorganisms to degrade the antibiotic upon repetitive addition, it is not achieved at the given environmental setup.

In today's world the majority of antibiotics prescribed is in combinations or synthetically prepared which makes the degradation process of antibiotics by the microbes' complex. In turn the antibiotics have a negative impact on soil microbe thus bringing down the nitrogen fixation by symbiotic and non symbiotic microbes. This survey was conducted having the main objective of creating awareness about the safe disposal of antibiotics and this forum is well suited for the same.

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