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ASSESSMENT OF KNOWLEDGE, ATTITUDE, AND PRACTICE TOWARD ANTIBIOTIC USE AMONGST HEALTHCARE PROFESSIONALS OF AN URBAN CITY

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Abstract

Context: AMS is "Use of **Right** antimicrobial agent, for the **Right** patient, at the **Right** time, with the **Right** dose, **Right** route and frequency, causing the least harm to the patient and the future patients." Therefore, for proper usage of antibiotics and prevention of development of resistance, all the Doctors should have adequate knowledge, right Attitudes and should have correct Practices. The following study was conducted to know the Awareness, Attitudes and Practices of Healthcare Professionals towards AMSP and antibiotic usage.

Aim: 1. To assess Knowledge, Attitudes and Practices about antibiotic Stewardship among Healthcare professionals.
2. To compare the results of participants at different positions i.e. Interns, residents and clinicians.

Settings and design:
It is a Cross sectional type of descriptive study with sample size of 227 conducted at Hospitals of the urban city.

Methods and materials: Questionnaire and interview based study.
Approval was taken from Institutional Ethics Committee (IEC).

Statistical analysis used:
SPSS version 23 was used for analysis of research.

Results:

Overall result:

- Knowledge of antibiotic usage and stewardship practices is about 77.4%.
- Attitudes on antibiotic usage and AMSP usage is about 81%.
- Practice of Antimicrobial Stewardship Program use in antibiotic prescription is about 50%.

Conclusions:
Although the overall results about the knowledge were quite satisfying but still there are more chances of improving the patient care. Overall results of practices are very poor. Measures for improvement are to be taken very fast.

Keywords: Antibiotics, Stewardship, Clinicians, Awareness
Abbreviations: AMS: Antimicrobial stewardship; **AMSP:** Antimicrobial Stewardship Program
Key Message: The subject of antibiotic resistance is of burning importance today. This research provides a comparative result among healthcare professionals at various positions about the topic Antibiotic Stewardship.

Introduction

Today, Antibiotics are most commonly prescribed medications. But once known as magic bullets, these antibiotics are now under the threat of antimicrobial resistance.[1] Due to injudicious use of antibiotics, the microbes undergo mutation and some of them even mutate to form Multidrug resistant organisms (MDRO's)/Superbugs.

It has been estimated by CDC that in United States alone more than two million people are sickened by antibiotic resistant infections causing at least 23,000 deaths annually .[2] WHO describes these Antibiotic Resistant Superbugs as "One of the biggest threat to global health, food security and development today".

To overcome this problem ICMR in 2013 launched Antimicrobial stewardship program (AMSP) under Antimicrobial Resistance Surveillance and Research Network. [3] AMS is "Use of **Right** antimicrobial agent, for the **Right** patient, at the **Right** time, with the **Right** dose, **Right** route and frequency, causing the least harm to the patient and the future patients."[4] Under AMSP a set of guidelines are laid down by every institution's AMS team to optimize the use of antibiotics. The subject of antibiotic resistance is of **burning importance** today.

There were a few references for the analysis of antibiotic usage and audit of various drugs and their resistance patterns. Even their have been awareness researches among various groups of people like Residents, clinicians,etc. There is **not much data** available as comparative study among healthcare worker's at various position.

Hence, this topic was chosen as ideally, all the Doctors should have adequate knowledge (about the antibiotics and their prescription guidelines), right Attitudes (towards overcoming the problem of AMR) and should have correct Practices (while prescribing the antibiotics).

Objectives:

1. To assess Knowledge, Attitudes and Practices about antibiotic Stewardship among Healthcare professionals (Interns, residents and clinicians)

2. To compare the results of participants at different positions i.e. Interns, residents and clinicians.

Methodology

Type of study: Cross sectional type of descriptive study

Place of study: Hospitals of the urban city

Sample Size: 227 (Minimum of 200) according to the calculations done by statistician

Study participants:

- Healthcare professionals working at various hospitals of the city.
- Interns and residents were recruited from the Tertiary care teaching hospital of the city.
- Clinicians were recruited from all over the city.

Study design:

Questionnaire and interview based study.

- Approval was taken from Institutional Ethics Committee (IEC).
- Study participants were recruited from various hospitals of the city (in the hospitals we could not reach Google form of the same questionnaire was made and circulated).
- Need of the study and confidentiality was explained to all the participating Doctors .
- Voluntary consent was taken.
- Data was collected by pre-designed and validated questionnaire

Hypothesis:

About knowledge and attitudes:

- **Null hypothesis:** There is no difference between the results of knowledge and attitudes among participants on different positions.
- **Alternate hypothesis:** There is significant difference between the results of knowledge and attitudes among participants on different positions.

About practices:

- **Null hypothesis:** There is no difference between the results about practices in residents and interns as compared to clinicians.
- **Alternate hypothesis:** There is significant difference between the results about practices in residents and interns as compared to clinicians.

RESULTS:

Study was conducted successfully and the results were analyzed using SPSS version 23.0. We collected data from 227 participants, which had 56 Interns, 45 Residents and 126 clinicians.

Socio- Demographic Data:

- ***Age distribution:***

30% of the population is in age group of 20-25 yrs while only 6% of the population lies in age group of 31-35yrs. and 46-50 yrs.

- **Years of experience:**

Table 1: Years of experience:

Years of Experience	Frequency	Percent
1-5 yrs.	109	48%
6-10 yrs.	29	13%
11-15 yrs.	44	19%
16-20 yrs.	18	8%
21-25 yrs.	19	8%
26-30 yrs.	5	2%
31-35 yrs.	3	1%
	227	100%

Knowledge Assessment:

About knowledge of antibiotic usage and stewardship practices is about **77.4%.**

***Applying z-test*:**

Applying **Z-test of proportion** to check our hypothesis, the difference was significant at P<0.05 for the following aspects and between following populations (i.e. **the P value for following results is less than 0.05 and we reject null hypothesis for them**):

- There was significant difference in the knowledge that **"whether all patients have to prescribed antibiotics"** among Interns and clinicians (z=4.62, P is o.ooo1) and among residents and clinicians (z=3.802, P=0.0001).
- There was significant difference in knowledge that **"culture and sensitivity is required for all bacterial infections"** amongst residents and clinicians (z=2.0003, P=0.001) only.
- Significant difference was noted in **"knowledge about antibiotic escalation and de-escalation"** amongst interns and clinicians (z=-2.4461, P=0.01428) and amongst residents and clinicians (z=-2.206, P=0.0271).

- Significant difference was also noted in **"knowledge about the term AMS"** amongst interns and clinicians (z=-2.7446, P=0.00614) and amongst residents and clinicians (z=-2.0061 ,P=0.0444)
- Significant difference in proportions of **"familiarity with antibiogram"** amongst interns and clinicians (z=-2.7446, P=0.00614) .While there was no significant difference between residents and clinicians.

Table 2: Data regarding the knowledge the study population on the whole

KNOWLEDGE ASSESSMENT	YES	NO
1. Do you know about the advantages and disadvantages of having a hospital antibiotic policy?	80% (182)	20% (45)
2. Do all patients have to be prescribed antibiotics?	16% (36)	84% (191)
3. Do have to do culture and sensitivity for all bacterial infections?	51% (115)	49% (112)
4. Do you know about the sensitivity pattern of antibiotics for common infections prevailing in your practice?	80% (182)	20% (45)
5. Do you know about antibiotic escalation and de-escalation?	60% (137)	40% (90)
6. Does irrational antibiotic prescribing lead to AMR?	96% (218)	4% (9)
7. Do you know the term antimicrobial stewardship?	37% (84)	63% (143)
8. Are you familiar with antibiogram?	36.6% (83)	64.4% (144)

Attitude assessment:

About attitudes on antibiotic usage and AMSP usage is about **81%.**

Applying z-test:

Applying **Z-test of proportion** to check hypothesis, the difference was significant at P<0.05 for the following aspects and between following populations (i.e. **the P value for following results is less than 0.05 and we reject null hypothesis for them**):

- There is significant difference in attitude about **"antibiotic usage being monitored by clinical pharmacologists"** amongst interns and clinicians (z=2.1986, P=.00278).
- Significant difference noted in attitude about **"knowing about sensitivity and resistance patterns of common bacterial infections"** amongst residents and clinicians (z=-2.703, P=0. 00694).
- Significant difference was seen in attitude **about "need to follow suggestion by Hospital Infection Control Committee"** amongst Interns and clinicians (z=3.6192,P=0.0003) and also amongst residents and clinicians (z=3.2301,P=0.00124)

Table 3: Data regarding the attitudes the study population on the whole

ATTITUDE ASSESSMENT	YES	NO
1. Do you feel that antibiotic usage should be monitored by clinical pharmacologists or infection control physicians?	91.6% (208)	8.40% (19)
2. Do you prefer to know more on sensitivity and resistance patterns of antibiotics from infection control team?	88.5% (201)	11.5% (26)
3. Are you interested in educating patients regarding antibiotic use and resistance?	93.40% (212)	6.60% (15)
4. Do you feel clinical pharmacologists should be involved in regulating the prescribers on rational therapies?	90.30% (205)	9.70% (22)

Practice assessment:

About actual practice of Antimicrobial Stewardship Program use in antibiotic prescription is just about **50%**.

Applying z-test:

Applying **Z-test of proportion** to check our hypothesis, the difference was significant at P<0.05 for the following aspects and between following populations (i.e**. the P value for following results is less than 0.05 and we reject null hypothesis for them**):

- Significant difference was noted in practice of **"prescribing AMA's on demand of patients"** amongst Interns and clinicians (z=-2.0221, P=0.004338).
- Significant difference was also noted in practice of **"Advising AST to all patients before starting AMA therapy"** amongst Interns and clinicians (z=8.6862, P=<0.00001) and amongst residents and clinicians (z=7.82, P=<0.00001).
- Significant difference noted amongst all the groups in the practice of **"taking advice of clinical pharmacologists in prescription of AMAs"**, amongst Interns and residents (z=2.4887, P=0.01278); amongst Interns and clinicians (z=5.9378, P=<0.00001) and amongst Residents and clinicians (z=2.7028, P=0.00694).
- Difference is noted for the practice to **"follow the suggestion by Hospital Infection Control committee"** amongst Interns and Clinicians (z=6.5201, P=<0.00001) and amongst residents and clinicians (z=5.9877, p=<0.00001). **[Table 4]**

Table 4: Data regarding the Practice of the study population on the whole

PRACTICE ASSESSMENT	YES	NO
1. Do you prescribe AMA's on the demand of patients?	11% (25)	89% (202)
2. Do you take the help of clinical pharmacologist to assist you in choosing the drug?	32% (73)	68% (154)
3. Do you report adverse effects of drugs to AMS team?	52.4% (119)	47.6% (108)
4. Did you attend any training in hospital stewardship practices?	27.3% (62)	72.7% (165)
5. Do you teach the rational antibiotic usage practices learnt to your juniors and friends and bring changes in the society?	82% (186)	12% (41)

Discussion:

The current rate of increase in antibiotic usage is alarming. Moreover, to increase in usage of these antimicrobials, more and more mutations are taking place in the organisms obeying the law of survival of fittest...

Problem now arises when the rate **of our new antibiotic production is not matching the rate of development of the mutations**... [5] And once a mutation for certain drug sets in the organism, the drug becomes ineffective for getting rid of the organism…Therefore, for the same organisms higher antibiotics have to be used. But this has its own disadvantages as higher antimicrobials come with more and dangerous side effects...Moreover, what if resistance develops to these higher and reserved antibiotics also???? Will there be no drug left to cure..??

Will the mutated organisms not spread to the society and if spreads…slowly all the organisms will get mutated and the level of AMAs will have to be raised…and then mutation for them too… Finally…**THERE WILL BE RETURN OF PRE ANTIBIOTIC ERA!!! WHERE PEOPLE WOULD BE DYING DUE TO INCURABLE DISEASES..!!**

Therefore, ICMR came out will AMSP in 2013 under Antimicrobial Resistance Surveillance and Research Network. [3] The basis aim of AMSP is to monitor the antibiotic usage, so as to judge the misuse of antibiotics and preventing formation of resistance...

Current study about the Antibiotic usage was carried out in an urban city among all the Healthcare professionals (Mainly Interns, Residents and Doctors) .Although healthcare workers also include nurses, ASHA workers and anganwadi workers;

PHC and CHC workers but since only the minor part of healthcare delivery is done by them in the cities they were not included in study.

Highest numbers of professionals i.e. 30% in this study lie in the age group of 20-25 yrs. followed by 22% lying in the age group of 36-40 yrs unlike the study by Badar V. et. Al. where most of the participants were in age group of 21-30 yrs. [6] Importance of young age group is that most of them at this age would be students, majority in their internship and few of them in their residency To **inculcate the sensitization** about the problem of drug resistance and MDRO's is of utmost importance because once they go out in their practice they won't have training about AMS. After getting into practice **Compliance** of clinicians also **decreases** i.e. most of them will prescribe antimicrobials either on their own understanding or will follow the **paths of their seniors**, which is very dangerous as it is not necessary that the antibiotics effective for that period will be effective today and place to place microbiological flora changes.

Moreover, interns along with their regular postings should be introduced to the AMSP program, use, its structure and its importance seeing the present conditions. About 48% of professionals have experience of about 1-5 yrs.; most of them would be interns, residents and some new clinicians. Followed by 20% of professionals have experience of 11-15 yrs. As years of experience increase **, practice becomes quite modified** as we get to know the sensitivity of organisms and effectiveness of various antibiotics…In some cases experienced clinicians become understanding enough about the proper usage of AMAs while in other cases the experienced clinicians due to **lack of time and in need of early results**, start irrational usage of AMAs.

Although specialties from clinicians were taken, it is of not much importance as AMSP program, use and rational antibiotic usage practices should be known to each and every healthcare professional irrespective of the specialization he /she has done.

Overall knowledge among all the clinicians is **77.4%.** In comparison knowledge about antibiotic usage and AMSP program was **better among clinicians**. No difference in knowledge was found among interns and residents (this may be due to the exposure about the AMAs and their resistance in the Microbiology and pharmacology subject) while clinicians had slightly better knowledge; this may be due to their **more years of experience**. 80% of the population knew about the advantages and the disadvantages of having a hospital antibiotic policy as compared to the study by Praveen et. al. where 90% of the participants knew about the advantages of having hospital antibiotic policy. [2]

Not all patients need to be prescribed antibiotics, today this has become the biggest reason for **irrational use** of antibiotics. In the cases where antibiotics are not required and then too prescribed, **kill the normal flora** of the body i.e. bacteria that are necessary for the body get killed.

Knowledge about this was considerably higher among the clinicians than in interns and residents.

80 % of the clinicians said that they were aware about the sensitivity patterns common infections which are prevalent in their practice , this result is better than the study of Praveen et. al. where 25% knew about sensitivity pattern of antibiotics for common infections prevailing in their practice. [2] Ideally, this result should be 100% i.e**. all the clinicians must be aware** about the fact because in some cases the organisms are sensitive to the lower antibiotics also but are directly started on higher antibiotics, which creates predisposition for mutation among the organisms. Ideally all the hospitals from small hospitals to the large tertiary care setups should have **hospital antibiotic policy** but when asked about it only 59% of the population gave the positive reply for it and 8% of the people were not sure that what exactly hospital antibiotic policy is. This result was comparatively less as compared to the study of Praveen et. al. where 81.7% knew that their hospital has antibiotic policy. [2]

When any serious patient comes to the hospital, for urgency of treatment and early relief , patient is instituted parenteral antibiotics or higher antibiotics (as AST is not possible) but after the availability of AST report there should be changes in the treatment i.e. antibiotics should either be **escalated or de-escalated**, according to the reports. There was significant difference in this aspect of knowledge among the various positions i.e. clinicians were well aware about this fact and said that they practiced it also but still many interns and residents were unaware about this fact. The overall people who knew about this are 60% compared to the study by Praveen et.al. about 70% people knew about this. [2] Many knew that irrational antibiotic prescription leads to AMR.

Not all antibiotics can be prescribed by the physicians will, certain antibiotics are reserved and can be used only after **authorization from senior physician** and knowledge about this in comparison was still poor among the interns and residents as compared to clinicians. Overall percentage was 89% though, as compared to the study by Malavika Singh and Anil Kumar where overall percentage was 72.5%. [7] For the term "AMS" itself ABOUT 63% were unaware about it and only about 32 % people knew about the antibiogram as compared to Tegagn GT et.al where nearly 48.6% of people were unfamiliar with term AMS and 43% with antibiogram. [8] Almost everyone was aware about the consequences of AMR; most of them believed that it would lead to drug resistant pathogen.

Overall attitudes on antibiotic usage were quite satisfying and is about **81%** but attitudes of interns was comparatively less than residents and clinicians, especially in the following aspects like "felt need of Antibiotic usage being monitored by clinical pharmacologists"; "Knowing about the sensitivity and resistance patterns of common bacterial infections" and "need to follow the suggestions by hospital infection control committee".

As compared to Knowledge and attitudes, overall result for the practice part is quite disheartening and is only **50%**. It may be because although clinicians in knowledge are well aware about the judicious use of antibiotics and are well aware about it and also have right attitudes about using antibiotics under the guidelines by AMSP but still **due to lack of time and hurry** of getting results they are not in the practice to judiciously use AMAs and this leads to development of AMR. Although 89% of the clinicians said that they don't have the practice to prescribe AMAs on demand of patients similar to Badar et. al. where about 91% said that this, still the result was still in comparison less among interns. [1] Only 38% of the clinicians recommended AST to all the patients before institution of antimicrobials unlike Badar et. al. [1] where this result is about 73.9%, but **ideally the practice should be of doing AST studies for all infections.**

While 29% said that they advise AMAs only in severe not responding cases and here again this practice could be correlated with working position of the Doctor. Majority of the population said that they were only sometimes correct in instituting empirical treatments and the treatment needs modification if prognosis is not good as reported by the patients but this **leads to loss of money on the part of patient and distress to the patient also.**

According to AMSP, clinical pharmacologists should help the clinicians in choosing the AMA but only 32% said that they follow this practice while in the study by Malavika Singh and Anil Kumar 47.4% people said that they follow this practice [7], and this practice was seen the least among the interns...This may be due to their unawareness of this fact. Ideally, every clinician should have **AMSP training twice every year** i.e. every 6 months a new antibiogram is to be made and the updated information is to be given to all the clinicians. Almost everyone was in practice to teach the antibiotic usage practices learnt to their juniors and friends to bring about changes in the society.

It is very important to resume to oral antibiotics after starting with parental antibiotics in the emergency conditions and 88% clinicians followed this practice .The correct criteria for selection of AMAs is "Clinical and experimental advice" which is mostly followed and not the clinical judgment alone because even if clinically a infection presents in a certain specified way still the organism causing the infection might not react in the same way as it reacts in all the cases.

The study has helped in creating the awareness among the Doctors about the importance of proper antibiotic usage.

In the future, more number of residents and interns can be considered in the study to eliminate bias. Even the ASHA's and Anganwadi workers and PHC workers who give prescribe antibiotics in the villages should be included in the study.

It can be concluded that although the overall results about the knowledge were quite satisfying but still there are **more chances of improving** the patient care. (We haven't reached the zenith yet). Changing in prescription patterns can be definitely modified by **education** (mainly in Interns and residents) and **creation of antimicrobial formularies** with restricted prescribing of targeted agents (mainly for residents and clinicians). Continuous **check on the prescribing patterns** should be done with feedback to the prescribers. Authorities should take some action to stop the inappropriate over the counter sale of antibiotics. **Design of Antimicrobial Stewardship** programs customized according to sensitivity and resistance patterns of the antibiotics in the hospital; should be made mandatory. The programs should cover along with common conditions, few of the uncommon conditions also. All the recommendations given should be **easily accessible** i.e. they can be either displayed on the walls, copies in the pocket size bulletins can be given to the clinicians. **Sensitizing the undergraduates and post graduates** is very important and concepts about AMSP and importance of maintaining discipline while prescribing antibiotics is extremely. The topic of antibiotic resistance and importance of following the AMSP programs should be **frequently touched upon in CMEs. Audits** about the resistance patterns among organisms and reasons of failure of treatment in patients, if any

Looking at the magnitude of the problem…It is important that we take the right steps hurriedly or else our wonder drugs/magic bullets will become ineffectual.

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