Therapeutic and Prophylactic Antibiotic prescription pattern among Sudanese Dentists

Tawassul AbdulRaheem Mohammed[1] MPH, Lamis AbdelGadir Kaddam[2]PhD

1- Department of community medicine, Faculty of Medicine Al Neelain University Khartoum, Sudan (tawassul.26@gmail.com)

2- Department of physiology Faculty of Medicine Al Neelain University Khartoum, Sudan. (lamiskaddam@hotmail.com)

Corresponding author:

Corresponding author: Lamis A. Kaddam email: lamiskaddam@hotmail.com

P.O. Box: 11121 Khartoum 12702 Al-Neelain University

Tel: +2499129797. Fax: +24983794422

Abstract

Background: Dentists prescribe antibiotics for many conditions. Antibiotics prescription becomes an essential aspect of dental practice. Most dental and periodontal diseases are managed by operative intervention and oral hygiene measures. Therefore, indications for systemic antibiotics in dentistry are limited. However, literature provides evidence of inadequate prescribing practices by dentists, which contributes to emergence of antibiotic-resistant bacteria. The aim of this study to investigate practice of antibiotics' prescription among Sudanese dentists.

Methodology: This study was conducted at Khartoum dental teaching hospital in 2017. A Self-administered, structured questionnaire was constructed and distributed to all dentinal practitioners (195 dentists). Data were computed and analyzed using SPSS 23 software.

Results: 123 questionnaires were filled and retuned the response rate 63%. Majority of respondents were females. Thirteen % of respondents received postgraduate education. The most common prescription was the combination of amoxicillin and metronidazole and for patients with allergy to penicillin was erythromycin. 66% used to prescribe antibiotics regularly after extraction. Considerable responders prescribed antibiotics as prophylaxis and for non-clinical factors like unsure of diagnosis, patient expectation of antibiotic and Delay/ unable to complete treatment.

Conclusion: There is overprescribing of antibiotics, as documented earlier in comparable settings. Significant number of the practitioners surveyed prescribe antibiotic prophylaxis for clinical procedures and medical conditions for which there is little evidence.

Key words: Antibiotics, Prescription, General Dental, Sudanese

Background

Antibiotics are agents that inhibits bacterial growth or kills bacteria(1).WHO Global Strategy defines the appropriate use of antimicrobials as “the cost-effective use of antimicrobials which maximizes clinical therapeutic effect while minimizing both drug-related toxicity and the development of antimicrobial resistance”(1). While the rational use of medicines has been defined by the World Health Organization WHO in 1985 as: “requires that patients receive medicines appropriate to their clinical needs, in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and the community”(2). The choice of antimicrobial should be guided by local or national resistance surveillance data and treatment guidelines. The reality is often far away from this ideal (3). Irrational use

of medicines is a global crisis (4). WHO estimates that more than half of all medicines are prescribed, dispensed, or sold improperly and that half of all patients fail to take them appropriately (5). Inappropriate use of antibiotics is one of the key factors underlying the global uprising of antimicrobial resistance, it also reduce the availability of other vital medicines or increase treatment cost(6). Inappropriate prescribing, dispensing practices, and prevalence of self-medication with antimicrobials found to be distressingly high in Sudan. The indicators of rational use of medicines have deteriorated over the past decade even with the implementation of managerial, regulatory and training interventions.(7)

Dentists prescribe between 7% and 11% of all common antibiotics In the UK, for example, dentists accounted for 7% of all community prescriptions of antimicrobials. Alternatively, the National Center for Disease Control and Prevention estimate that approximately one-third of all outpatient antibiotic prescriptions are needless (8).Increasing resistance crises of recent years are probably related to over- or misuse of broad-spectrum agents(1). Nowadays some bacterial species are resistant to the full range of antibiotics presently available. These serious complications associated with antibiotics use have encouraged studies investigating antibiotic prescribing practices of dentists(8).

Several studies were conducted worldwide to assess the knowledge and habits of the dentists towards the antibiotics prescriptions; however, the information available on this issue is scarce**.** Previous studies reveled the need for urgent review of dental undergraduate and postgraduate education in antibiotic prescribing (9). And provision of prescribing guidelines may improve knowledge and encourage the proper use of antibiotics in dental practices(9).Another one demonstrated a lack of uniformity among the dental practitioners, and recommended dentists should make themselves aware of the current guidelines available, to ensure highest degree of patient care(10).

More common dental infections present in the form of pulpits and periapical periodontitis, which necessitate only operative measures like fillings, root canal therapy, or extraction if the tooth is not restorable (8). Unfortunately, dentists still prescribe antibiotics for this condition(8). A distressing finding was that a number of dentists prescribe antibiotics for viral infections like herpes simplex virus-1 infections(11). Another aspect of antibiotic over-prescribing is prescribing based on non-clinical factors. Patient's expectation of an antibiotic prescription, convenience, and demand necessitated by the social background of the patients are considered unscientific reasons for antibiotic prescription. Dailey, and Martin study, provided support to the hypothesis that antibiotics are being inappropriately prescribed by the dental profession(12). This evidence supported by many other studies ;concluding that the dentists should know the scientific basis for the prescription of antibiotics during dental treatment (13).

The use of antibiotics as prophylaxis for focal infection is common practice, and has been widely accepted in the dental profession (14). Most studies on prophylactic antibiotic use carried out in developed countries, and the results generally indicated that dentists have a good knowledge of prescribing. Few studies done in developing countries reported abuse of prophylactic antibiotics to cover either a defect in aseptic clinical technique or improperly sterilized equipment(8). Previous study suggested Practitioners prescribe antibiotic prophylaxis for clinical procedures and medical conditions for which there is little evidence (15). Like surgical procedures for patients at risk from endocarditis (15,16)

In many developing countries –Like Sudan- antibiotics are delivered without a prescription, subsequently emergence of resistance is even worse. In addition, without standard treatment guidelines, antibiotics are often over-prescribed by health workers and over-used by the public. That is why we need appropriate measures to support rational prescribing to reduce emerging incidence of antibiotic resistance and other side effects of antibiotic misuse. Never the less scarce information regarding dentists' antibiotics

prescription practice at developing countries are available. Therefore, our aim from this research is to study the practice of general dental practitioners regarding prescription of antibiotics, in Khartoum dental teaching hospital.

Methodology:

The study was an observational descriptive cross-sectional study conducted at Khartoum dental teaching hospital, which consider the biggest dental hospital in Sudan. Accommodates a valuable number of dentists with different professional levels and receives a considerable number of

patients from all parts of the country. The hospital compose of many departments includes (oral and maxillofacial surgery, conservative treatment, periodontology, pediatric dentistry, prosthodontics, implantology and dental public health department. Our target was all dentists working in Khartoum dental teaching hospital at the time of study (195 dentists). This hospital was chosen for the study because it is the biggest training center in Sudan for dentists. In addition, most of certified dentists conducted their horsemanship in Khartoum Teaching hospital. Inclusion criteria: General dental practitioner, graduated from Sudanese universities, both genders. Exclusion criteria: Dental students, registrar and consultants, other health workers.

Data were collected using a structured, closed ended, Self-administered questionnaire, based on literature and previous studies (10,11,14-16). Questionnaire pre tested and validated by 5 dentists and the results were not included in the final analysis. The total population was 195

The data analysis: Data were analyzed using SPSS Version 23. Univariate and bivariate analysis were carried out. The univariate analysis focused on drawing percentages, proportions of the dentists as regards personal characteristics and practice. Each correct answer was given a score of 1 and incorrect answers were given 0.

Results

One hundred and ninety-five questionnaires were distributed to dentists. Those who agreed to participate in this study were 123 with Response rate of 63.08%. The majority of our respondents were females, younger than 29 years old and newly graduated doctors as presented in Table 1.

A few numbers of respondents received postgraduate education in antibiotic prescription. The most common antibiotics prescribed was the combination of amoxicillin and metronidazole followed by amoclan 625 mg (Figure 1). For patients with allergy to penicillin erythromycin followed by clindamycin 300 mg (Figure2). 65.9% used to prescribe antibiotics regularly after extraction (table 4). Among respondents 69.1% would prescribe prophylaxis for patients with prosthetic joint implant and 83.7% for patients with history of organ transplantation (Table 5). 71.5% would prescribe antibiotics for Irreversible Pulpitis, moderate/severe preoperative symptoms. A considerable number of responding dentist would prescribe antibiotics for Prevention of postoperative complications. About non clinical factors the rates were 26.0%, 33.3%, 16.3%, 56.1% for Unsure of diagnosis, Pressure of time and workload, Patient expectation of antibiotic and Delay/ unable to complete treatment respectively (Figure 4). Significant association between year of graduation and practice score among dentists (Figure5).

Discussion

This study is a hospital-based study targeted the GDPs to assess their practice regarding the prescription of antibiotics. The total population was 195 and the respondents were 123 giving a response rate of 63% which consider an acceptable rate hence some studies in literature showed less rates as 31.1%(16). Among respondents,

82.9% were female and 17.1% males. Most of them 55.3% were 20-24 years old. The majority were fresh graduated (table1). Generally GDPs that had graduated recently had slightly better practice compared to GDPs with more experience(Figure 5).These results concurred with a similar study performed in northeast of England(17). This is probably due to the more recent and fresh evidence-based information of recent graduates. While there were no significant differences between respondents in relation to gender, age, and university (table 6).

[Table 2] shows that, GDPs prescribed antibiotics mostly due to clinical symptoms and general considerations. Over 70% used to prescribe antibiotics for swelling and postoperative complications. More than 30% of respondents for pain and presence of periapical pathology, and 14.6% when diagnosis is uncertain. These results are almost more than twice of those reported in India where 17.24% of participants prescribe antibiotics for swelling , 30.7% for pain, 0.3% for uncertain diagnosis, 6.0% for prevention of post operative complications , 1.3%, for presence of periapical pathology (10). Present study [Table 3] shows the percentages of respondents who prescribe the antibiotics for various endodontic conditions. The first condition of irreversible Pulpitis, mod/severe preoperative, although there is no indication for the prescription of antibiotics(13), More than 70% of respondents prescribe antibiotics which is unjustified and unnecessary. This finding shows negligence of scientific basis for antibiotics prescription. Irreversible Pulpitis with acute apical periodontitis, mod/severe preoperative symptoms, is a non-infected condition with vital pulp and without systemic involvement. Thus this condition does not need antibiotics, only the removal of cause and prescription of the analgesics(16). However, 57% of the respondents have prescribed the antibiotics for this condition, which is unjustified Table 4). Similar practice has been observed in previous studies ranged from 10-40 %of the respondents (10)(13)(16). In case of Necrotic pulp with chronic apical periodontitis, no swelling, no/mild preoperative symptoms, although there is no clear-cut indication for the prescription of antibiotic for this condition 22.8%of the respondents have prescribed antibiotics. Our results is comparable with previous survey done in north of Saudi Arabia (13).In case of Necrotic pulp with acute apical periodontitis, no swelling, mod/severe preoperative symptoms for which 45.5% of our responding dentists prescribe antibiotics.

It can be considered an over prescription as there is no need of antibiotic prescription in this condition and accurate treatment is non- surgical root canal treatment and analgesics. Our participants' response similar to the previous studies, having the response range from 30%-71% (18). Necrotic pulp with chronic apical periodontitis, sinus tract present, no/mild preoperative symptoms, the effective management of this condition without systemic involvement is, non-surgical endodontic treatment, to remove the cause with drainage and analgesics for pain if indicated(13). Antibiotic prescription is justified only when there is systematic manifestations or non-healing sinus even so 55% of our dentists' prescribed antibiotics. This result is almost twice of the results revealed by Rodriguez-Núñez, et al(16) . The last endodontic condition in the current study is necrotic pulp with acute apical periodontitis, swelling present, mod/severe preoperative symptoms, when the condition shows systemic involvement then antibiotic prescription is acceptable along with nonsurgical debridement of the root canal system and incision and drainage. 87.0% response rate in the present study is comparable with response rates of 94.3% of the Spanish , 77% of Saudis and (56.4%)of Indians (16)(13)(10).

An interesting finding in this study is that 66% of our respondents used to prescribe antibiotics regularly after any extraction and 40.7% after any RCT, which is definitely unjustified, and the scientific guidelines are obviously neglected (table 4).

Antibiotic prophylaxis prior to invasive dental treatment Should be given to patients with a history of prosthetic cardiac valve Cardiac transplantation recipients, who develop cardiac valvulopathy and some congenital heart disease (19). The National Institute for Health and Care Excellence (NICE) issued Clinical Guideline which states that antibiotic prophylaxis against infective endocarditis is not recommended for people undergoing dental procedures(20). There's no evidence that antibiotic prophylaxis prior to dental treatment is of any benefit to patients. In addition, there is no evidence that prophylaxis is beneficial for patients with prosthetic joints(20). Unfortunately, 95 % of our participants in this study still believe in the prescription of antibiotics prophylactically for patients with a history of previous infective endocarditis, and 78.0%, 42.3%, believe in prophylaxis for patients with a history of previous rheumatic fever and angina respectively (table 5). Antibiotic prophylaxis is recommended in dental

procedures that involve manipulation of gingival tissue or the periapical region of teeth or perforation of the oral mucosa, while prophylaxis for routine anesthetic injections through non-infected tissue, taking dental radiographs, placement of removable prosthodontic or orthodontic appliances, root canals treatment is not reasonable(21)(22). Though 54.5%, 12.2% used to give prophylaxis prior to RCT and routine anesthetic injections respectively (table 6)

The decision to prescribe antibiotics must be based on a thorough medical history, clinical examination, and accurate diagnosis. So, the last question in our questionnaire assigned to assess the non-clinical factors that cause GDPs to prescribe antibiotics, which include patient expectation of antibiotic 16.3%, Pressure of time and workload 33.3%, Unsure of diagnosis 26.0% and Delay/ unable to complete treatment 56.1% (Fig 4). Whereas N. Palmer et al reported that most of the practitioners in the survey (90%) would not be influenced to prescribe antibiotics because of patient expectation, 30% would prescribe because of shortage of time and 47% if they were unable to make a definitive diagnosis (23),these results are comparable to our present study.

The evidence from this study suggests that a significant number of the practitioners surveyed prescribed prophylactic antibiotics inappropriately, both for surgical procedures and for patients at risk from endocarditis. Our results reveled that practitioner prescribed antibiotic prophylaxis for clinical procedures and medical conditions for which there is little evidence. The evidence from this study suggests that a significant number of the practitioners surveyed prescribed prophylactic antibiotics inappropriately, both for surgical procedures and for patients at risk from endocarditis.

Keep in mind, this study conducted in teaching hospital setting where junior staff can consult seniors and peers. We could assume that the situation may be worse among community practitioners. This study should be replicated among community practitioners for more generalizable results.

Conclusion: This study supports the assumption that there is overprescribing of antibiotics for both therapeutic and prophylactic conditions. Most of dentists surveyed use antibiotics routinely for conditions where local treatment would be adequate, large proportion prescribed antibiotics due to non-clinical factors**.**

We recommend to review undergraduate curriculum and increase the provision of postgraduate courses, training, workshops and other educational initiatives on antibiotic prescription practice. There is also an urgent need for consistent antimicrobial policies to be taught to dental undergraduates within schools and GDPs need clear guidelines on prescribing antibiotics.

Community awareness programs for the dentists and the community about the global problems of misuse of antibiotics and antibiotic resistance so that they can play a role in controlling these global problems.

Abbreviation

GDP: General Dental Practitioner

RCT: Root Canal Treatment

OMF: Oral Maxillary Facial

Ethics approval and consent to participate:

The study was approved by the Central Institutional Review Board IRB Al Neelain University. And by Research Ethics Committee Khartoum Teaching Dental Hospital. Written informed consent was obtained from each participant prior to enrollment.

Consent for publication:

Principal investigator obtained informed consent from each participant to publish the data without breaching confidentiality.

Availability of data and material: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests:

We declare no conflict of interest

Funding:

No fund was obtained

Table (1) Frequency distributions of Demographic data

		Number	Percentage	Total
Age	20-24	68	55.3%	123
	25-29	51	41.5%	
	30 and more	4	3.3%	
Gender	Male	21	17.1%	123
	Female	102	82.9%	
Year of graduation	2016	19	15.4%	123
	2015	71	57.7%	
	2014	12	9.8%	
	2013	9	7.3%	
	<2013	12	9.8%	
Job description	House officer	90	73.2%	

	Medical officer	33	26.8%	123
Department	OMF surgery	90	73.2%	123
	conservative treatment	18	14.6%	
	pediatric dentistry	15	12.2%	
	Periodontology	0	0.0%	

Table (2) When do you prescribe Antibiotics (most commonly), according to, clinical symptoms and general considerations?

Condition		NO	%	Total
Elevated temperature + Evidence of systemic spread	Wrong answer	10	8 %	100%
	Correct answer	113	92%	
For Swelling	Wrong answer	92	74.8%	100%
	Correct answer	31	25.2%	
For Pain	Wrong answer	39	31.7%	100%
	Correct answer	84	68.3%	
Diagnosis not certain	Wrong answer	18	14.6%	100%
	Correct answer	105	85.4%	
Prevention of postoperative complications	Wrong answer	87	70.7%	100%
	Correct answer	36	29.3%	
	Wrong answer	39	31.7%	100%

Presence of Periapical pathology in radiograph	Correct answer	84	68.3%	

Table (3): For which of the following endodontic conditions, do you prescribe antibiotics?

Condition		No	%	Total
Irreversible Pulpitis, mod/severe preoperative symptoms	wrong answer	88	71.5%	100%
	Correct answer	35	28.5%	
Irreversible Pulpitis with acute apical periodontitis, mod/severe preoperative symptoms	wrong answer	70	57%	
	Correct answer	53	43%	100%
Necrotic pulp with chronic apical periodontitis, no swelling, no/mild preoperative symptoms	wrong answer	28	22.8%	
	Correct answer	95	77.2%	100%
Necrotic pulp with acute apical periodontitis, no swelling, mod/severe preoperative symptoms	wrong answer	56	45.5%	
	Correct answer	67	54.5%	100%
Necrotic pulp with chronic apical periodontitis, sinus tract present, no/mild preoperative symptoms	wrong answer	68	55.3%	
	Correct answer	55	44.7%	100%
Necrotic pulp with acute apical periodontitis, swelling	wrong answer	16	13.0%	
	Correct answer	107	87.0%	100%

present, mod/severe preoperative symptoms				

Table (4) Do you prescribe antibiotics post operatively for the following conditions?

		No	%	Total
Root Canal Treatment	wrong answer	50	40.7%	100%
	Correct answer	73	59.3%	
Tooth extraction	wrong answer	81	65.9%	100%
	Correct answer	42	34.1%	

Table (5) Do you recommend to prescribe antibiotic prophylactically for the following Conditions?

Conditions		No	%	Total
Prosthetic cardiac valve	Wrong answer	11	8.9%	100%
	Correct answer	112	91.1%	
Previous infective endocarditis	Wrong answer	6	4.9%	100%
	Correct answer	117	95.1%	
Cardiac transplantation recipients, who develop cardiac valvulopathy	Wrong answer	21	17.1%	100%
	Correct answer	102	82.9%	
Previous Rheumatic Fever	Wrong answer	96	78.0%	100%
	Correct answer	27	22.0%	

Angina	Wrong answer	52	42.3%	100%
	Correct answer	71	57.7%	
Cardiac Failure	Wrong answer	58	47.2%	100%
	Correct answer	65	52.8%	

Table (6): For which of the following dental procedures prophylaxis is recommended in cardiac cases:

		No	%	Total
Dentoalveolar surgery/Periodontal surgery	Wrong answer	6	4.9%	100%
	Correct answer	117	95.1%	
Apical surgery	Wrong answer	20	16.3%	100%
	Correct answer	103	83.7%	
Biopsy	Wrong answer	33	26.8%	100%
	Correct answer	90	73.2%	
Matrix bands or rubber dam clamp (subgingival)	Wrong answer	83	67.5%	100%
	Correct answer	40	32.5%	
Orthodontic bands (subgingival)	Wrong answer	82	66.7%	100%
	Correct answer	41	33.3%	
Subgingival scaling/probing	Wrong answer	61	49.6%	100%
	Correct answer	62	50.4%	
Taking dental radiographs	Wrong answer	7	5.7%	100%
	Correct answer	116	94.3%	
Dental impressions	Wrong answer	5	4.1%	100%

	Correct answer	118	95.9%	
Routine dental anesthetic injections through non-infected tissue	Wrong answer	15	12.2%	100%
	Correct answer	108	87.8%	
Root canal treatment	Wrong answer	67	54.5%	100%
	Correct answer	56	45.5%	

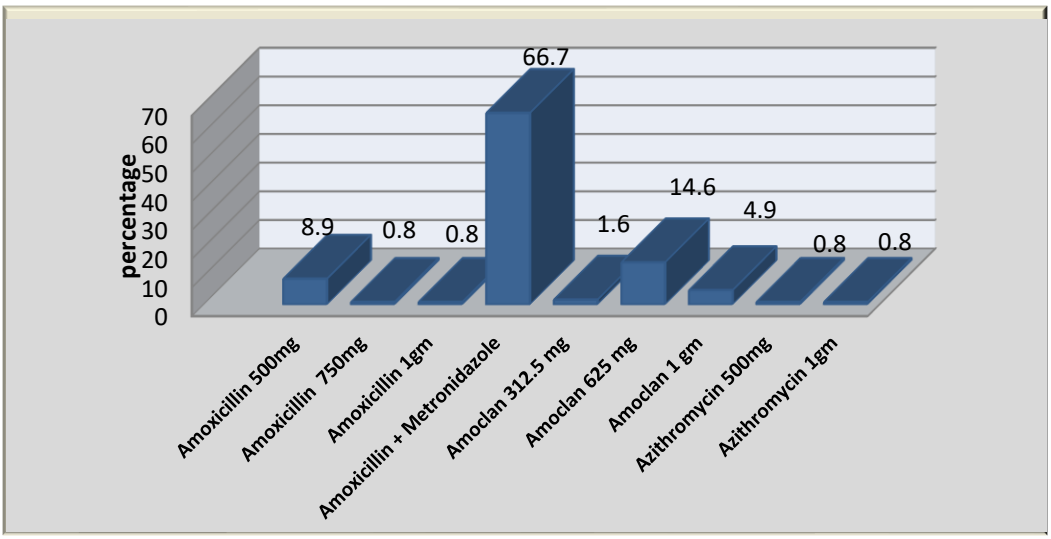

Figure (1): The most common type of antibiotic prescribed, with no medical allergies

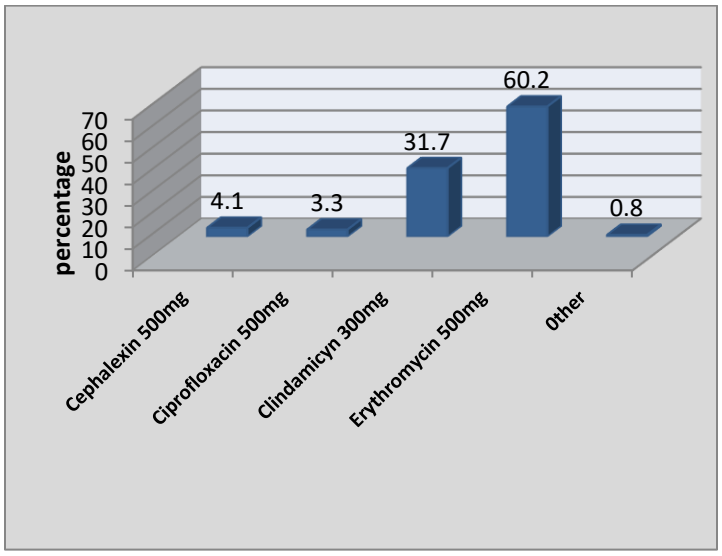

Figure (2): The most common type of antibiotic prescribed in case of penicillin allergy

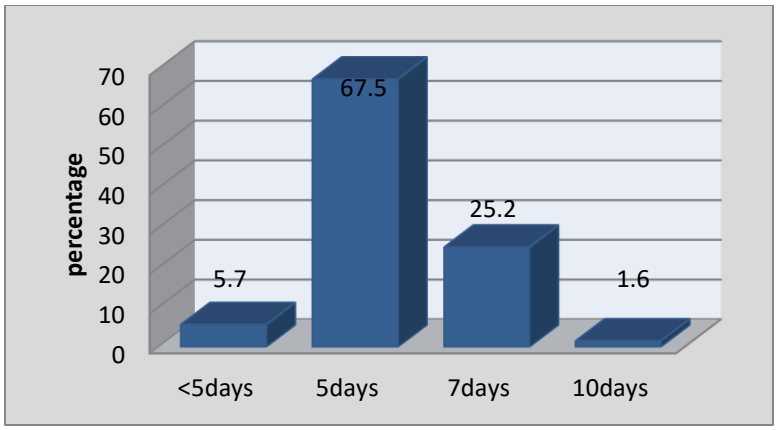

Figure (3) How long do you prescribe antibiotics?

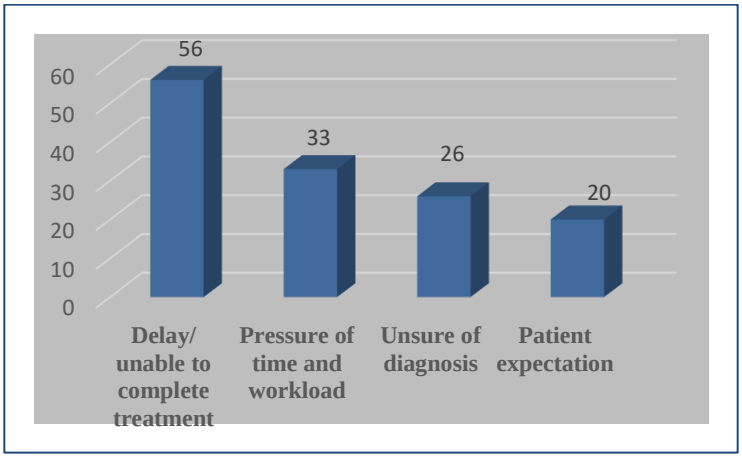

Figure (4): Prescribing antibiotics for non-clinical factors

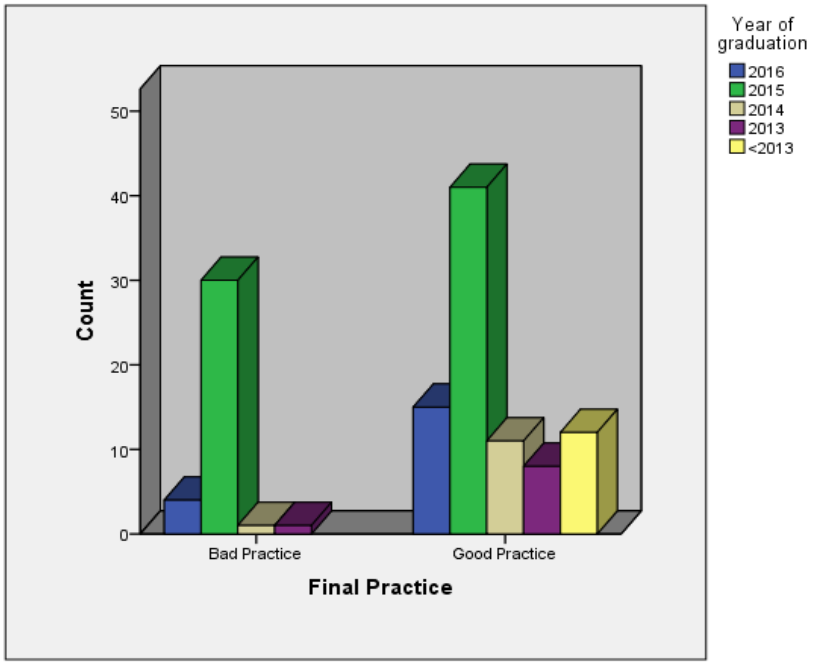

Figure (5) Cross table of Final Practice * Year of graduation

chi-square value= 15.11

P-value of association test = .003

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