

Editorial

How to Stay in the Line?

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In a world of growing technology, commercialization of healthcare has become easier than ever. Facilitated by a revolution in all social media platforms, we cannot predict how this revolution is going to impact our dental practice in few years' time. Many concerns have been raised on the fear of commercialisation of oral health care, as dentists are becoming more and more business driven. Even more fearful is how our profession will be perceived by the eye of the public, will we be perceived as healthcare providers or businesspersons. Indeed, dentistry can be considered as both a profession and a business, but how do we stay in the line of professionalism and maintain our ethical standards as healthcare providers while still running responsible business.

Maintaining advertising standards is one of the challenges dentists faces in today's age of digitalization. Every now and then all types of advertisements pop out claiming the perfect smile solution is the way to go, new innovative materials and faster treatments. Dentists are obligated to put patients interests first and any decision should be made for the patient's best interest and wellbeing. But how do dental professionals know if they are crossing the line when it comes to advertising their services. Commercialisation of dental care has placed the dentist in a foggy area particularly when providing cosmetic dental procedures. I once came across a statement that states; "Ethics is knowing the difference between what you have a right to do and what is right to do" Therefore the answer to this question is differentiating between doing the right thing and knowing your rights, this will make sure dentists stay in the line when advertising their dental procedures.

Advertising is about putting the best forwards, and the stronger the claims the stronger the evidence must be. Dentists have a duty of care to communicate truthfully with their patients from advertising dental treatments and products to delivering oral health

care. This is defined as "Veracity" which is the fifth principle in the ADA code of ethics. Veracity is about being truthful and honest; it is the foundation of trust in any patient-dentist relationship. Veracity can also affect other principles such as autonomy and beneficences especially in dental marketing and advertisement. Dentists can easily advertise their products in way that could affect the patients' own decision-making process and self-determination on the expenses of expanding their profits/income. Furthermore, advertisements that are unsupported by evidence can be deceiving and misleading to the public. A study conducted in the UK exploring the quality of evidence some advertisements have claimed in dental journals have shown that only 10% of the advertisement were supported by evidence, of which only 2% was of high-quality evidence. In the light of this clinicians need be critical of the manufactures and products they advertise as patients can be easily misled which will not only impact on the patients' trust but the profession as a whole. We need to carefully assess the quality of dental advertisements; dentist should come across to the public as ethical and professional as their advertisements claim. This would make sure dental professionals always stay on the right side of the line, as with the pace of how the market is growing, who knows what the future is holding for our trusted profession.

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Original article

Assessing the level of awareness and behaviour among a group of Libyans in Benghazi city during the coronavirus (COVID-19) pandemic

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ABSTRACT

Objectives: The study aimed to assess Benghazi Libyan patients' awareness level and behaviour towards the COVID-19 pandemic at the time of the breakthrough of the disease.

Methods: A survey using a questionnaire was conducted on 101 adult patients who visited dental clinic services and diabetic centres in Benghazi at the time of breakthrough of the COVID-19 pandemic.

Results: The participants were from different age groups (20 to 79) and comprised of males (72.3%) and females (27.7%) who had different education levels. The majority of participants 90 (89.1%) had enough idea about the symptoms of COVID-19 and (84.2%), were aware enough of the direction of COVID-19. Approximately half (49.5%) of respondents affirmed that they didn't have any of the symptoms of COVID-19. Whereas 3% had muscle pain, 5% had a dry cough, and 4% had strong headaches, 6% of participants complained of multiple symptoms of severe headache, dry cough, muscle pain, and loss of sense of taste and smell, 7% complained of fever for two weeks with muscle pain. 7% of participants did not quarantine themselves when they met patients infected with coronavirus symptoms and 8% never quarantined themselves. (89.1%) wear masks outside of their houses, while 48 (47.5%) removed their masks from time to time outside their houses, and 21% reused their masks. (89.1%) did not see a patient with coronavirus while they were aware of the disease.

Conclusion: Most of study individuals had adequate knowledge about COVID-19 and were aware of its symptoms. Their behaviour during the pandemic breakthrough was adequate to protect themselves from cross-contamination.

Keywords: Symptoms of COVID-19, public awareness, and behaviour during COVID-19

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INTRODUCTION

Coronavirus disease is taken into account as a worldwide health emergency which is referred to as (COVID-19) is caused by (SARS-CoV-2) and is known as severe acute respiratory syndrome coronavirus 2. The genus Betacoronavirus is additionally divided into subgenerations: Sarbecovirus, Hibecovirus, Nobecovirus,

Merbecovirus, and Embecovirus.¹ SARS-CoV-2 had been classified as a Betacoronavirus genus subgenus Sarbecovirus.^{1,2}

SARS-CoV-2 belongs to the Coronaviridae a family of single-stranded RNA viruses, Coronaviridae family considers an outsized family, it contains a spread of viral species. The coronavirus family is split into two subfamilies: Letovirinae and Orthocoronavirinae, SARS-CoV-2 is assessed as an orthocoronavirus subfamily. The orthocoronavirus also divided into four generations: Alphacoronavirus, Betacoronavirus, Gammacoronavirus and Deltacoronavirus.³

The first outbreak of COVID-19 was reported in December 2019 in Wuhan, China. The World

Health Organization (2020) stated the outbreak of COVID-19 as a global pandemic.⁴ In spite of preventive measures and control applied steadily, the number of cases increased dramatically. That is why the WHO on January 30 and March 11, 2020, respectively affirmed COVID-19 as a public health emergency of global health crisis and thereafter as a pandemic.⁵ WHO had cautioned that countries with poor healthcare systems may not be able to deal with the COVID-19 outbreak with many in the African continent being of particular concern.⁶

COVID-19 is confirmed as a main global health crisis worldwide; this is because it can cause death due to breathing failure.⁷ World Health Organization stated some precautions and measures to prevent in spreading of COVID-19. For example, regular hand washing, covering mouth and nose when coughing and sneezing and avoiding touching the face. Besides, mostly avoid close contact (social distance) with anyone who has symptoms of respiratory diseases such as coughing and sneezing.⁸ Since the spread of COVID-19 began in Libya in late March, several educational and awareness campaigns have been conducted about it across the country such as lectures, TV, and radio interviews, these campaigns were carried out by professional and expert people particularly from different Libyan universities through active lectures, social media, and online meetings. They had a significant role in influencing the awareness and culture of the Libyan people regarding the spread of COVID-19. However, Libya was one of the last countries in the region to report the first case of COVID-19.^{8,9}

On March 18, 2020 the Libyan minister issued the full curfew decision.¹⁰ Whereas, on March 24, 2020, the National Centre for Disease Control in Libya has been reported the first case which has tested positive for COVID-19.¹¹

Literature has shown the current level of awareness among doctors and nurses concerning COVID-19 with special consideration for those responsible for caring for patients with COVID-19.¹² In March 2020, the number of cases has increased progressively at the time of the spread of the COVID-19 pandemic. Despite the preventive measures and other safety instructions implemented to stop the spread of COVID-19 in Libya, the number of infected cases continued to increase significantly.¹³ This condition mounted unparalleled pressure on the public health systems in many Libyan cities.

The cases reached 166,888 people across the country and this number has been increasing every day. The number of deaths reached 2,807, while the

number of recovered reached 152,328. However, in Libya, the main concern is the limited public knowledge and awareness of COVID-19 along with social and cultural norms of gathering, which can facilitate its transmission through Libya. Awareness and preparedness for the COVID-19 pandemic were low among healthcare workers in low-resource settings in Libya.^{11,12}

This study sheds light on the awareness level and behaviours among a random sample of Benghazi Libyan patients towards the COVID-19 pandemic, which was still unknown and unidentified at the time of data collection. For this reason, the researchers formulated the following research questions:

1. What is the awareness level of Benghazi Libyan patients towards the COVID-19 pandemic?
2. What is the behaviour of Benghazi Libyan patients towards the COVID-19 pandemic?
3. How do Benghazi Libyan patients deal with the COVID-19 pandemic?

METHODOLOGY AND STUDY DESIGN

The study was conducted between October - December 2020 during the pandemic. At that time, the Libyan dental syndicate decided to open dental medical centres and be limited to emergency treatments only and they mandated working according a protocol placed by "The Libyan consultative medical committee to combat the corona pandemic".

The study was approved by the committee of faculty of dentistry at the university of Benghazi - the specialist centre for oral and dental education Benghazi and the diabetic public centre in Benghazi.

The study was conducted on different age groups who visited "the specialist centre for oral and dental education Benghazi" and "the diabetic public centre in Benghazi". And was carried out at the time only emergency treatments were available to the patients by a decision of 'the Libyan consultative medical committee to combat the corona pandemic'. The participants who visited these centres were asked to participate voluntarily in this study, and agreed with a full conviction and consent to taking part in this study and all of them suit the criteria.

The collected data were in the form of a questionnaire filled under the supervision of four dentists to ensure that volunteers understand the question correctly.

The questionnaire was designed in Arabic and English and was pre-validated by some professional academics to determine the adequacy and clarity of the questions, and it was thereafter reviewed accordingly. Questionnaires with unfinished information or missing data were excluded from the analysis.

The questionnaire comprised of three sections, the first section enclosed demographic characteristics such as age, gender, city, and educational level. The second section addressed the awareness level of Benghazi Libyan patients towards the COVID-19 pandemic. The third section included the behaviour of Benghazi Libyan patients towards the COVID-19 pandemic. Data were presented with frequencies and proportions and were analysed using Statistical Package for Social Sciences software (SPSS) software, version 25. Descriptive statistics were used to examine respondents' characteristics and responses using frequencies and percentages. The researchers described categorical variables as frequencies and percentages. The Kolmogorov-Smirnov test revealed that the variables did not follow a normal

distribution. We conducted the Mann-Whitney U-test to identify differences between two groups of continuous variables.

RESULTS

Demographic characteristics of a total of 101 Benghazi Libyan patients completed the questionnaire. Table 1 summarizes the characteristics of the respondents. The age range of the participants was from 20 –79 years divided into 6 groups. The highest group was in the 50-59 category of age (38.6%). Males 73 (72.3%) were more than the females 28 (27.7%). The majority of respondents 93 (92.1%) were from Benghazi city and 8 (7.9%) were from out of Benghazi city who came to Benghazi for their emergency treatment. According to educational level, 42 respondents (41.6%) reported that they were at the university level, high institute (17, 16.8%), intermediate institute and secondary school level (11%), and preparatory (10 %), whereas, the uneducated and primary levels (5%) each.

Table 1: Demographic Characteristics the participants (n=101)

Characteristics	Frequency	Percentage%
<i>Age (years)</i>		
Less than 30	20	19.8
30 – 39	3	3.0
40 – 49	20	19.8
50 – 59	39	38.6
60 – 69	15	14.9
70 – 79	4	4.0
Total	101	100%
<i>City</i>		
Benghazi district	93	92.1
Out of Benghazi	8	7.9
Total	101	100%
<i>Educational level</i>		
Uneducated	5	5.0
Primary	5	5.0
Preparatory	10	9.9
Secondary	11	10.9
Intermediate institute	11	10.9
High Institute	17	16.8
University	42	41.6
Total	101	100%

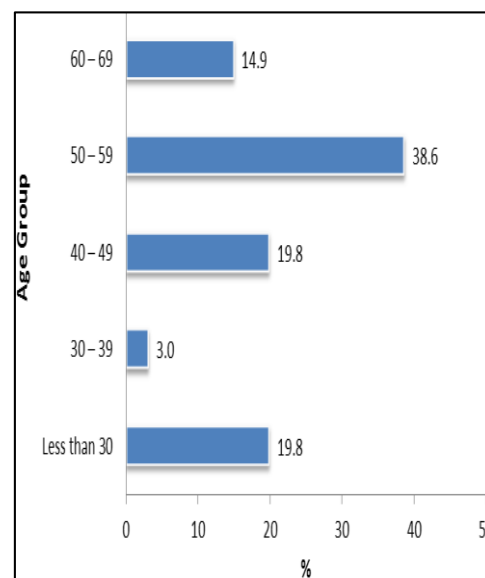


Figure 1. Distribution of age groups of study participants (n=101)

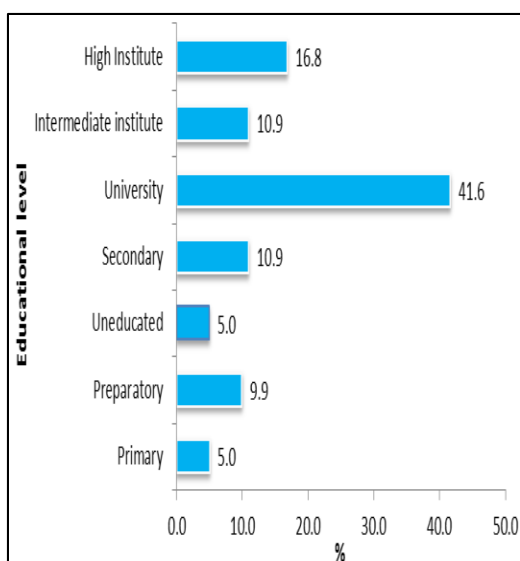


Figure 2. Educational level characteristics of study participants (n=101)

Awareness level of Benghazi patients (n=101) towards COVID-19

Table 2: showed the current status of COVID-19 awareness among Benghazi patients. The descriptions of each item in the questionnaire were shown in this Table. The majority, 85 (84.2%) were aware enough of the direction of COVID-19. The majority of participants 90 (89.1%) had enough idea about the symptoms of COVID-19. Most of the participants 90 (89.1%) did not see a patient with coronavirus while they were aware of the disease. On the other hand, around 50 (49.5%) of respondents affirmed that they didn't have any of the symptoms of COVID-19.

Table 2: The awareness level among the total sample of 101 Benghazi patients towards COVID-19

Characteristics	Frequency	Percentage
Do you have awareness of the direction of COVID-19?		
I have enough awareness	85	84.2
I do not have enough awareness	16	15.8
Total	101	100%
Do you have enough idea about the symptoms of COVID-19?		
Yes	90	89.1
No	11	10.9
Total	101	100%
Have you had symptoms related to coronavirus?		
Muscle pain	3	3.0
Dry cough	5	5.0
strong headache	4	4.0
Severe headache, dry cough, muscle pain, loss of sense of taste and smell	6	5.9
I had a fever for two weeks, muscle pain, other than that	7	6.9
Other than that,	6	5.9
Loss of the sense of taste and smell	9	8.9
I didn't have any of the symptoms	50	49.5
Total	101	100%
Did you see a patient with coronavirus while you were aware of the disease?		
Yes	11	10.9
No	90	89.1
Total	101	100%
If the answer is yes, have you been subjected to quarantine?		
I never quarantined myself	5	6.9
Yes, it was committed to 2 weeks	6	7.9
Total	101	100%

Table 3: The behaviour of Benghazi patients towards COVID-19

Characteristics	Frequency	Percentage
Do you take precautions such as holding away or covering your nose while coughing or sneezing?		
Yes	83	82.2
No	18	17.8
Do you wear a mask when you go out of the house?		
Yes	90	89.1
No	11	10.9
Do you remove the mask from time to time outside the home?		
Sometimes	48	47.5
Always	9	8.9
I don't do that	23	22.8
Do you reuse the mask?		
Yes	21	20.8
No	59	58.4
When you remove the mask, do you touch the front of the mask?		
Sometimes	11	10.9
No	54	53.5
Yes	15	14.9
Have you participated in social activities such as places of worship, weddings, and funerals?		
Sometimes	44	43.6
Always	23	22.8
I've never done this	34	33.7
Do you wash your hands when you enter the house for 20 seconds?		
Sometimes	8	7.9
Wash my hands for 20 seconds	69	68.3
Wash my hands for less than 20 seconds	21	20.8
I don't wash my hands when I enter the house	3	3.0

Do you sterilize your shoes when you enter the house?		
Sometimes	12	11.9
No	69	68.3
Yes	19	18.8
Do you disinfect your hands or surfaces with alcohol while you are outdoors?		
Sometimes	35	34.7
Always	28	27.7
I don't do that	38	37.6
Do you disinfect the items stored in the stores when you return home?		
Sometimes	24	23.8
No	42	41.6
Yes	35	34.7
Do you use alcohol to disinfect yourself after entering the house?		
Sometimes	28	27.7
Always	35	34.7
I don't do that	38	37.6
Total	101	100%

Behaviours of Benghazi patients towards COVID-19 & how they deal with the COVID-19 pandemic

The descriptions of each item related to the behaviours of Benghazi patients regarding COVID-19 were presented in table (3). The majority of participants, 83 (82.2%), take precautions such as holding away or covering the nose while coughing or sneezing. Most of the 90 participants (89.1%) wear masks when they had been out of their houses, while, some of the participants 48 (47.5%) remove their masks from time to time outside their homes. A majority of participants 69 (68.3%) wash their hands when they enter their houses for 20 seconds. However, around 69 (68.3%) did not disinfect their shoes with alcohol when they entered their houses.

DISCUSSION

Coronavirus disease is a global outbreak viral disease that requires emergency health care and

medical facility resources. In this study, the researchers explored the awareness level and behaviours of a group of Benghazi Libyan patients towards the COVID-19 pandemic.

In dental practices, because the risk of cross-infection with COVID-19 may occur between dental practitioners and dental patients, strict and effective infection control protocols are urgently needed. According to WHO definition, droplets are $\geq 5\text{-}10\text{ }\mu\text{m}$ in diameter and aerosols are $\geq 5\text{-}10\text{ }\mu\text{m}$ in diameter. However, both can be generated as a continuum of particle sizes during numerous respiratory activities and their behaviours are not distinct. Aerosols are generated during heavy breathing, coughing, talking and singing causing an exhalation plume of respiratory particles of varying sizes, containing potentially infective viral material.¹⁴⁻²⁰

The inhalational risk may be reduced by social distancing, limiting interaction indoors, avoiding air recirculation, improving natural and artificial ventilation, and innovative engineering solutions which collect and neutralize aerosols to provide clean air in personal and community spaces.¹⁹⁻²¹

In the early course of COVID-19, there are high loads of the virus in the upper respiratory tract such as the pharynx.²² It was suggested that the buildings with insufficient indoor ventilation may cause interpersonal aerosol transmission.²³

Our study revealed that the individuals had enough knowledge regarding preventive behaviours such as holding away or covering the nose while coughing or sneezing, most of them wearing masks when they had been out of their homes, washing their hands when they enter their houses for 20 seconds (83%, 89%, 68.3%). But participants who did not disinfect their shoes with alcohol when they entered their homes formed (68.3%) of the participants. Aleanizy, & Alqahtani, also showed that health workers in Saudi sample were aware of the infection control behaviour measures.²⁴

In our study regarding the level of awareness rated high (84.2%), Whereas, (89.1%) had enough idea about the different symptoms of COVID-19. Most of them (89.1%) did not contact a suspected patient with coronavirus while they were aware of the disease. Likely, a study by Sigh et al., 2020 showed that Indian participants had enough knowledge about the awareness, threat, and symptoms of the COVID-19 outbreak and its prevention.²⁵

In order to protect the countries from COVID-19 spread with a special focus on poor and weaker health infrastructure in developing countries, effective strategies and funds were set up by WHO globally to control the infection.²⁶

The level of awareness about COVID-19 signs, symptoms, and preventive measures among individuals from different Arabic countries in Egypt, Jordan, UAE, KSA, Qatar, and Palestine showed that a good level of awareness of the participants regarding COVID-19 was significantly correlated with older participants those who attended awareness campaigns, secondary school education holders, higher education diploma holders, university degree holders, those who have post-graduate education, and healthcare employees.²⁷

CONCLUSION

In conclusion, this study provides an overview of the awareness level and behaviour of Benghazi patients towards the COVID-19 pandemic. Most Benghazi patients perceived that they had adequate knowledge about COVID-19 and they were aware of the symptoms of COVID-19. Regarding their behaviour towards COVID-19, the majority of participants take preventive measures to prevent the spread of COVID -19. As an example, they wear masks when they go out of their houses and wash their hands when they enter their houses for 20 seconds. According to this sample, the majority knew health practices. According to this study's results, it becomes clear how Benghazi patients coped with the COVID-19 pandemic. That could be due to following high media instructions and adherence to public health measures during the highest pandemic time.

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Original article

Infection Control Practice: A cross-sectional Survey on Dental Laboratory Technicians in Benghazi, Libya

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ABSTRACT:

Objectives: Infection control represents the main concern in dental laboratories in recent years regarding the perceived risk of patients and professionals from getting infected. Even if the dental technicians do not come in direct contact with the patient's oral cavity, there is a risk of contamination from the prosthetic items coming from the dental office. The purpose of this study was to evaluate the knowledge, attitude, and practice of dental lab technicians toward infection control protocols at the dental laboratories of Benghazi, Libya.

Materials and Method: A descriptive cross-sectional study was conducted among prosthodontic dental technicians in the city of Benghazi, Libya. A self-administered questionnaire was distributed as a hard copy to the dental lab technicians working at both governmental and private dental laboratories (3 governmental and 7 private dental laboratories). The data was conducted using the SPSS program (SPSS 16 for windows, SPSS Inc., Chicago, USA); a P-value of 0.05 or less was considered significant.

Results: The response rate among dental technicians was 93%. The major age group of participants was (21-40 years) who work in a private dental laboratory with less than ten years of experience. 60.2% of the technicians had a valid hepatitis B vaccination, and 46.2% had received infection control training courses as part of their orientation, when respondents were asked about the most dangerous steps in the dental laboratory 60.1% of them answered dealing with impressions.

Conclusion: Within the limitations of the present study, the respondents demonstrated varying levels of knowledge, attitude and infection control practices. More efforts are needed to improve infection control practices and to apply appropriate policies in order to ensure the safety of the technicians and patients.

Keywords: *infection control, disinfection, cross-contamination, dental technicians, dental laboratories*

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INTRODUCTION

Infection control represents the main concern in dental laboratories in recent years regarding the perceived risk of patients and professionals from getting infected.¹ Before the 1970s, infection control was not performed in dental laboratories though

there was a major concern about handling "high-risk patients" items.² As a result, diseases can be transmitted during treatment if preventive measures are not taken. The risk of cross-contamination has been documented in various studies in dental clinics as well as in laboratories.³

Infection control was first recommended by the American Dental Association (ADA) in laboratories through the Centers for Disease Control (CDC) guidelines and recommendations. It was published first in 1986 and revised in 1993.⁴ The CDC defines standard precautions as “any standard of care designed to protect health care personnel and patients from pathogens that can be spread by blood or any other bodily fluid, excretion, or secretion”.⁵ Standard precautions include the use of personal protective equipment (PPE), cleaning and disinfecting environmental surfaces, sterile devices and instruments, safe injection practices, sharp safety, hand washing, and respiratory hygiene with cough etiquette.⁶

An infection can be transferred from the cast to the dental technologist/ technician in the dental laboratory by unwashed hands, aerosols, pumice, burs, and surface contact handpiece.⁷ Various studies reported the contamination of prostheses and dental laboratory equipment from oral and non-oral pathogens.⁸⁻¹⁰ Bacterial organisms, such as *Bacillus species*, *coagulase-negative Staphylococci*, *Micrococcus species*, and *Streptococcus species* were the most prevalent contaminants.⁸ These organisms were found in the base of dentures sent to the laboratory. Moodley KL, *et al.*,¹¹ reported that 11% of gypsum cast samples and 8% of the impressions were contaminated with *Candida species*. Furthermore, bacteria from the Enterobacteriaceae family (gut flora), including *Acinetobacter*, *Pseudomonas*, and *Klebsiella*, were also present on the denture base.⁹^{10,12} However, some of these microorganisms can cause systemic diseases as they colonize on the denture surface, lead to colonization of the bacteria on the oropharynx, and eventually increase the patient risks for pneumonia, especially in immune-compromised patients.¹¹

Thus, adequate infection control should be performed on the dental prostheses, impressions, and other prosthodontic materials, which are sent to the laboratory and upon return to the dental clinic. Utilizing pumice with disinfectants or sterile pumice and rag wheels will significantly reduce cross-contamination in the laboratory. Additionally, the use of protective barriers, such as protective glasses, gloves, and aprons, should be a routine procedure by the dentists, dental laboratory technicians, and all auxiliary personnel who are involved in these procedures.¹³ A similar cross-sectional study¹⁴ was conducted in Jeddah, Saudi Arabia recommended that infection control protocols are mandatory in dental laboratories and dental clinics. Another study conducted in some cities in Libya regarding awareness of dental technician's safety recommended that laboratory managers and technicians must take care of all personal protection tools and do training regularly.¹⁵

This study aimed to evaluate dental lab technicians' knowledge, attitude, and practice toward infection control protocols in the dental laboratories of Benghazi, Libya.

MATERIALS AND METHODS

The study was following the ethical standards of the institutional research committee of Benghazi University, Libya, with ethical approval number 110. A descriptive cross-sectional study was conducted in 2022 among 100 dental technicians who participated in the questionnaire to obtain information regarding infection control in the dental laboratories in the city of Benghazi, Libya. This study is targeted to investigate the knowledge and attitude of dental technicians working in the public and private sectors (including those working in dental Faculties). A pilot study was conducted on 17 technicians 9 males and 8 females then distribute 100 forms the response rate was 93%.

The validity of the questionnaires was tested by distributing the questionnaire and analyzing the results of the pilot study and the feedback of the primary study as well as using some critical questions regards of working experience and years of practice and knowledge. Inclusion criteria for all dental technicians who are working in a dental laboratory in Benghazi city exclusion criteria for dental technicians who are not Libyan citizens. The questionnaire was in English language and adopted from the previous studies^{2,16} The nature and objectives of this study were explained to each participant and their inquiries were answered.

The questionnaire consisted of 14 close-ended questions that covered three major sections. The first section included demographic data (gender, age, work institution, and the number of years of experience). The second section was about the laboratory information. While the third section of the questionnaire covered the respondents' knowledge assessment, practice, and attitude toward infection control procedures. Data collection was extended over three months from January 2022 to April 2022. Response categories for each of the knowledge's questions were 'yes', 'sometimes', and 'no', and these answers were coded as 1, 2, and 3, respectively. Uncompleted questionnaires were excluded from the study. The data was conducted using the SPSS program (SPSS 16.0 for windows, SPSS Inc., Chicago, USA). The Chi-square test was used to analyze the association among variables at a 0.05 level of significance.

RESULTS

Out of 100 dental laboratory technicians to whom the questionnaire was sent, only 93 technicians responded. Participants' distribution and demographic data were summarized by their age, gender, work institution, and years of experience

(Table 1). The majority (69.9%, 65) were males and (30.1%, 28) were females. Just below half of the respondents (49.5%, 46) were of (31-40 years) age group, while (44.1%, 41) were of (21-30 years), and (4.3%, 4) were of (41-50 years) and only (2.2%, 2) were of (more than 50 years). Fifty-two respondents (55.9%) were private dental practitioners, while forty-one respondents (44.1%) were governmental dental practitioners. Regarding the years of work experience, (34.4%, 32) of the respondents had 6-10 years, and the majority (38.7%, 36) had 1-5 years of work experience in the practice of dental laboratory. According to the laboratory information, the most critical step in terms of contagion exposure in the laboratory was all of the steps (68.8%), followed by dealing with the impression (66.1%), using sharp instruments (11.8%), repairing (2.2%) and then flame came afterword (1.1%) (Figure 1).

Furthermore, only 60.2% (56) were vaccinated for the Hepatitis B virus (HBV). (Figure 2).

TABLE 1. Distribution of the study sample according to socio-demographic and occupation characteristics

Item	Group	No. (%)
Gender	Male	65 (69.9)
	Female	28 (30.1)
Age groups (Yrs.)	21-30	41 (44.1)
	31-40	46 (49.5)
	41-50	4 (4.3)
	>50	2 (2.2)
Work institution	Governmental	41 (44.1)
	Private	52 (55.9)
Years of work experience	1-5	36 (38.7)
	6-10	32 (34.4)
	> 10	25 (26.9)

FIG. 1. Bar graph showing frequency and percentage of the most critical steps in a dental lab.

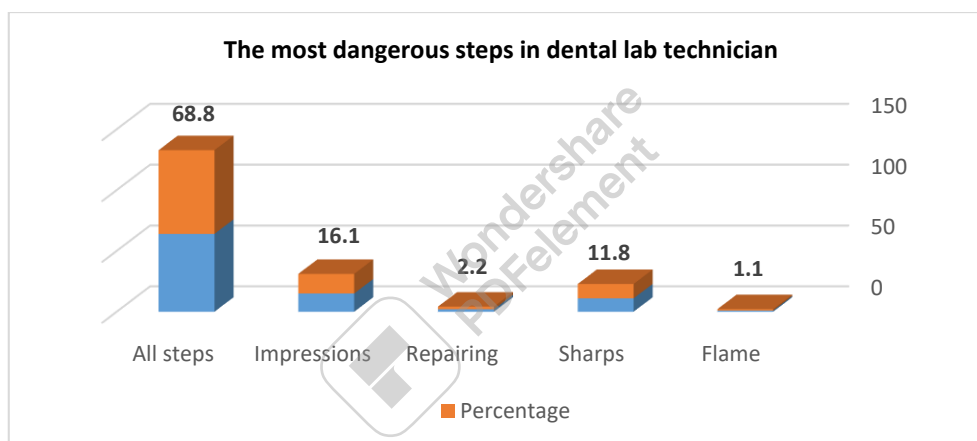


FIG. 2. A hepatitis B vaccination

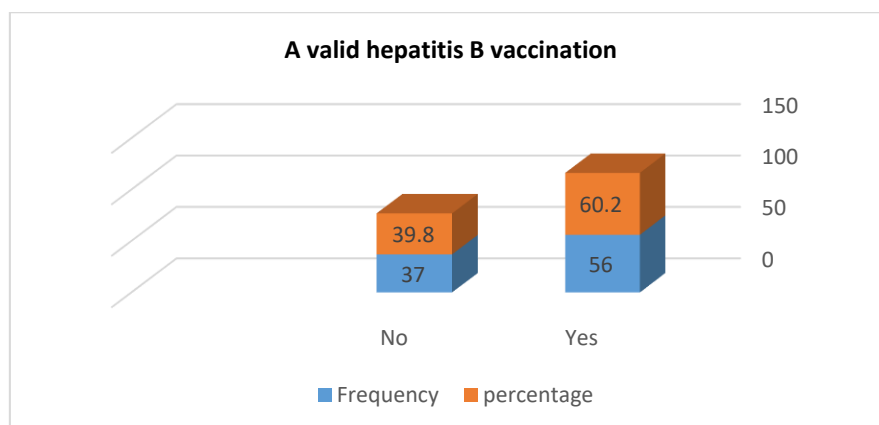


Table 2 shows the responses to questions related to the knowledge and attitude of dental technicians. The majority (60.2% and 62.4%) have written infection control protocol in their lab and have two polishing machines for repaired and new dentures. Just above a quarter of respondents consider infection control measures as an extra cost and less than half of them received training on disinfection. Table 3 shows the practices related to infection control among lab technicians. The majority wear PPE all the time (66.7%) and disinfect material on receiving and

sending them. Above quarter (28%) always change the pumice powder in the polishing machine. Table 4 shows a comparison of these practices by characteristics of participants. Males and private-sector workers were more likely to wear PPE ($p=0.044$ and 0.000 , respectively). On the other hand, females and private workers were more likely to disinfect materials at the end of work ($p=0.028$ and 0.002 , respectively). No significant differences were observed by years of experience.

TABLE 2. The Knowledge and Attitude of Dental Technicians Regarding Infection Control Guidelines

Questions	Yes (%)	No (%)
Received any training courses on disinfection	43 (46.2)	50 (53.8)
Have a written protocol for disinfection	56 (60.2)	37 (39.8)
Have two polishing machines one for new and another for repaired dentures	58 (62.4)	35 (37.6)
Cross-infection measures represent an added cost to be added on	24 (25.8)	69 (74.2)

TABLE 3. Dental Technicians' Practices Regarding Infection Control

Practices	Yes No (%)	Sometimes No (%)	No No (%)
Wear Personal protective equipment during the whole steps of the work?	62 (66.7)	18 (19.4)	13 (14)
Disinfect your materials including impressions when you received them from the clinic?	71 (76.3)	20 (21.5)	2 (2.2)
Disinfect your materials at the end of work?	71 (76.3)	12 (12.9)	10 (10.8)
Regularly change water pumice powder in the polishing machine?	26 (28)	61 (65.6)	6 (6.5)

TABLE 4. Comparisons of Infection Control Practices by Sociodemographic Characteristics of Participants

Variable		Wear PPE the whole steps of the work No. (%)	Disinfect materials when received from the clinic No. (%)	Disinfect your materials at the end of the work No. (%)	Regularly change water pumice powder in the polishing machine No. (%)
Gender	Male	59 (90.8)	63 (96.9)	55 (84.6)	62 (95.4)
	Female	21 (75)	28 (100)	28 (100)	25 (89.3)
	P-value	0.044	0.348	0.028	0.272
Work institution	Governmental	29 (70.7)	40 (97.6)	32 (78)	37 (90.2)
	Private	51 (98.1)	51 (98.1)	51 (98.1)	50 (96.2)
	P-value	0.000	0.865	0.002	0.249
Years of work experience	1-5Yrs.	32 (88.9)	34 (94.4)	33 (91.7)	34 (94.4)
	6-10 Yrs.	30 (90.9)	33 (100)	29 (87.9)	29 (87.9)
	> 10 Yrs.	18 (75)	24 (100)	21 (87.5)	24 (100)
	P-value	190	0.198	0.835	0.177

Chi-square test was used to compare subgroups, p set at 0.0

DISCUSSION

Infection control is very crucial in a dental laboratory therefore dental technologists/technicians can be prevented from getting infected.¹ Even if the dental technicians do not come in direct contact with the patient's oral cavity, there is a risk of contamination from the prosthetic items coming from the dental office. The study revealed that more than 60% of the dental offices' prostheses delivered to the dental laboratories were contaminated with pathogenic microorganisms originating from the patients' oral cavities.¹⁷ Studies results revealed the presence of bacteria such as *Klebsiella oxytoca*, *Escherichia coli*, *Enterobacter cloacae*, and *Mycobacterium tuberculosis* on the dental impressions.^{17, 18} Also, finishing and polishing prostheses have been described as the biggest sources of contamination in prosthetic laboratories.¹⁷

Despite the rigorous control of disinfection and sterilization of the equipment and instruments in dental offices, prosthetic devices do not always receive an adequate procedure for infection control.¹ Therefore, The use of effective infection control procedures in the dental laboratory and the dental office will prevent cross-contamination that may extend to dental technicians, dental office staff, patients, and dentists.^{16,19,20} This survey was conducted to evaluate the level of knowledge, attitudes, and practices of dental laboratory technicians in Benghazi, Libya regarding infection control procedures.

Given the result of this study, 76.3% of the dental technicians carried out disinfection of all impressions brought to their dental laboratories. The remaining 21.9% of the dental laboratories sometimes disinfect the impression and only 14% of the dental laboratories relied on dental clinics to disinfect the impressions; thus, they did not disinfect them. These results confirm findings published in another study conducted by Sedky *et al.*²¹ reported that more than 84.00% of the technicians carried out disinfection of all impressions in their dental laboratories. In contrast, a study by Sammy and Benjamin² recorded that only 33.33% of the technicians personally disinfected their impressions. This could be a result of a lack of proper communication between dental laboratories and dental clinics. Therefore, written communication should be tagged on every prosthesis or impression indicating that it has been disinfected with a specific disinfectant for a certain period to avoid confusion about whether an impression had been disinfected or not, as well as prevention of duplication of services.²

Concerning the use of personal protective equipment (PPE) only 66.7% of the dental laboratories wore (PPE) while working. Another study reported that 84% of dental technicians wore eyeglasses regularly

and 59% occasionally use a facial shield while working or polishing dentures.¹ Wearing PPE such as eye protection, and a face mask/shield is mandatory to minimize the potential for cross-contamination, and disease transmission and avoid injury when operating rotatory equipment. For example, gloves and lab coats are equally important because they prevent cross-contamination, and face masks prevent aerosol inhalation with particle sizes as small as 50 microns.²

Regarding hepatitis B vaccination, 60.2% of the dental technicians who participated in this study had a valid hepatitis B vaccination, On the other hand, 39.8% of the dental laboratories required employees to submit valid hepatitis B vaccination records. This finding is almost similar to a study conducted in South Korea revealing that 63% of the dental laboratories had a valid hepatitis B vaccination.²² More than half of the participants are hepatitis B vaccinated, dental technicians, and at increased risk of accidental puncture and other injuries. In other words, dental technicians contact with several harmful factors during their profession,²³ which will increase the risk of infection and cross-contamination.^{18, 23, 24} According to the Guidelines for Developing a Dental Laboratory Infection-Control Protocol by the International Journal of Prosthodontics in 1992,²⁵ all laboratory personnel who have not had antibody testing revealing immunity or have not been previously vaccinated should receive hepatitis B virus immunization.

CONCLUSION

Within the limitations of the present study, the respondents demonstrated varying levels of knowledge, attitude and infection control practices. More efforts are needed to improve infection control practices and to apply appropriate policies in order to ensure the safety of the technicians and patients.

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Conflicts of interest

There are no conflicts of interest.

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Original article

Quality of Orthodontic Records Keeping: A clinical audit

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ABSTRACT

Objectives: To assess the quality of keeping orthodontic records. A further aim was to raise awareness of undertaking clinical audits to improve the quality of patient care.

Methods: Retrospective records of 50 patients undergoing orthodontic treatment at the Faculty of Dentistry, University of Benghazi, were collected to assess the quality of clinical record keeping in practice. The assessment was done by one orthodontist, by measuring 11 different criteria. Furthermore, to decide on any future changes to be done. Statistical analysis was done by descriptive analysis.

Results: The personal information were taken by 100%. Medical history was consistently checked but not updated or signed. 64% of cases came to the clinic with referral letters. The oral examination showed that 42% of patients had good oral hygiene, with 50% had fair oral hygiene, while, 8% with poor oral hygiene. 38% of patients had carious lesions. A form for treatment plan consent was not used, it had been taken verbally by 98%. The skeletal pattern showed, class I by 42%, class II was 52%, while class III accounted for 6%. On the other hand, dental malocclusion showed the following: 30% of class I, 56% class II division 1, 6% class II division 2 and class III 8%.

Conclusion: This self-audit highlights the shortcomings in the collected records. Furthermore, this procedure shows how an audit can be performed in any area of orthodontics to improve the quality of patient care.

Keywords: orthodontic records, clinical audits, quality, patient care.

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INTRODUCTION

The World Health Organization recognizes that being healthy is not limited to the absence of disease or infirmity. Their definition expands to encompass entire physical, mental and social well-being.^{1,2} Professional dentists and oral physicians adhere to a patient-centred approach to delivering a state of art treatment, considering their patient's well-being. As clinicians, we are aware of the inconsistent quality of dental care that may lead to dwindling of public trust in dental practitioners.¹ Therefore, there is an obligation to adhere to best practice guidelines and clinical governance to lessen malpractice.³ Clinical efficiency ought to be vital to the culture and quality of dental services

provided by dental teams, whether in academic or small clinical units settings.³ Surrounded by progressively critical circumstances, undertaking clinical audits is an imperative transparent and evidence-based strategy to validate and demonstrate the quality of service delivered. Furthermore, data utilized by clinical audits allows objective comparison with the 'gold standards' and become a source of information required to make positive adjustments.³⁻⁵

Historically, an audit is an old concept recorded in the Domesday Book as early as 1066, along with the development of national statistics of births and deaths.⁶ Recently, the United Kingdom introduced the concept of clinical audit. Principles for best practice in the clinical audit was one of several studies issued by the National Institute for Health and Clinical Excellence (NICE).⁵ That publications define clinical audit as a quality improvement procedure that strives to enhance patient outcomes and care through a systematic review of care compared to predetermined criteria and the

application of change. Selected characteristics of the care structure, procedures, and results are systematically assessed against predetermined standards.⁵ When appropriate, individual, team or service level modifications are made, and additional monitoring is employed to verify improvement in healthcare delivery (Figure 1).

Therefore, the present clinical audit aimed to assess the quality of clinical record keeping at clinical practice of the Orthodontic Department at Faculty of Dentistry, University of Benghazi.

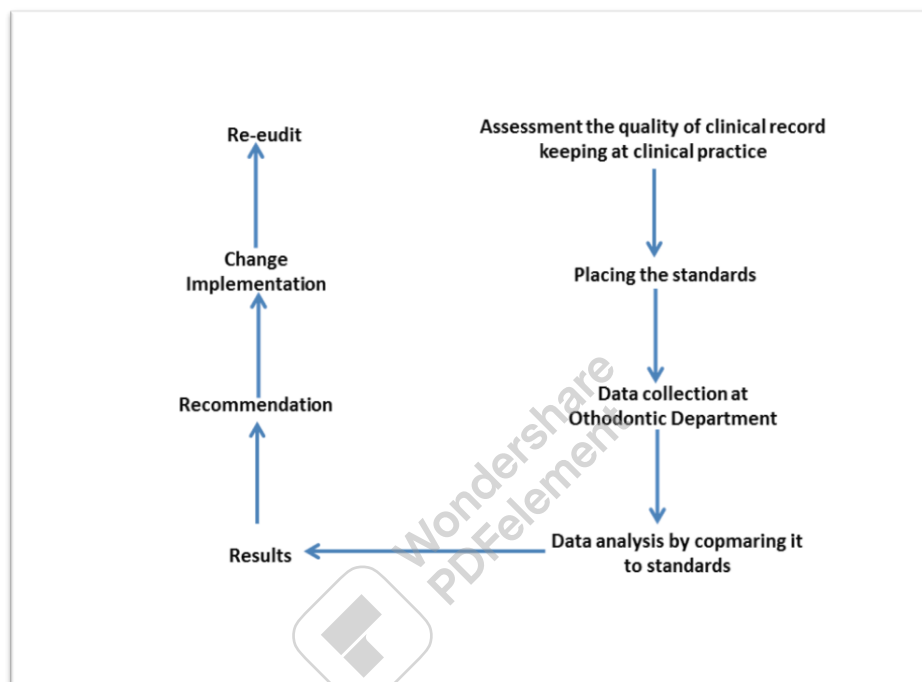


Figure1: Steps of audit procedure

METHODS:

This was a retrospective clinical audit to assess the standards of clinical record keeping of 50 patients who attended the orthodontic department clinic at the Faculty of Dentistry, University of Benghazi, with the objective of improving the quality of clinical record keeping in practice. Ethical approval was granted by the Dental faculty and consent form was obtained from the included patients. One orthodontist undertook the records assessment. Eleven criteria were explored,^{7,8} including; patient's identification information, medical history, referral details, oral health, radiographs, consent, skeletal pattern, occlusion classification,

Index of Orthodontic Treatment Need (IOTN), laboratory work, extra and intraoral photographs. Table 1 provides the details of these criteria. The collected data was analyzed using descriptive statistics to compute means and standard deviations of the variables using SPSS version 23 (SPSS, IBM, Armonk, NY, USA) and compared to the golden standard that is based on the trust's health record-keeping policy⁹ to identify any problems and decide on any future changes to be made.

Table 1: Details of the patients' clinical records.

No.	Explored criteria
1	Patient's identification information (Full name, Date of birth, Gender, Full contact details of patient and parents)
2	Medical history (Updated and signed medical history form)
3	Referral details (Referring from a general dental practitioner, Referral date, Date of patient contact)
4	Oral health (Good/Fair/Poor, and carious lesions)
5	Radiographs (Type of radiographs undertaken, Justification and reports)
6	Consent (Treatment options recorded, Treatment plan with written informed consent, Written cost estimate form, Orthodontic charting)
7	Skeletal pattern (Class I, Class II and class III)
8	Occlusion classification (Class I, ClassII division 1, Class II division 2 and ClassIII)
9	Index of Orthodontic Treatment Need (IOTN)
10	Laboratory request form (Laboratory receipts, study models)
11	Extra and intraoral photographs

RESULTS

In this retrospective audit 50 files of orthodontic patients, from the orthodontic department, at university of Benghazi were analyzed to determine whether the diagnostic data and records were sufficiently collected and kept or they required some changes. For personal information, the full name of patients, date of birth, and contact details were taken from all patients by 100%. Medical history was consistently checked but not updated or signed. 64% of the examined cases came to the orthodontic clinic with referral letters, they were referred from general dentists, as well as Pedodontic and Oral Diagnosis Departments, on the other hand 36% of patients came to the clinic without referral reports. In diagnostic sheet form the referral date and the patient contact date were written for all patients by 100%. The clinical examination that checks the oral health showed

that 42% of patients had a good oral hygiene, with 50% had fair oral hygiene, while, a poor oral hygiene had been noted in 8% of patients. Carious lesions were found in 38% of the patients. Lateral cephalograms and orthopantomographs (OPG) were taken as a routine diagnostic records in 92% of patients. 8% of patients were asked either for lateral cephalograms or OPG. A verbal consent for treatment plan were taken from patients by 98%. A form for treatment plan agreement consent was not used, the treatment plan was discussed with all patients or their parents verbally. Also, a written cost estimate form and orthodontic charting were not applicable. In this sample the skeletal pattern according to radiographic analysis showed that skeletal class I was present by 42%, class II scored the highest prevalence class by 52%, while class III accounted only for 6%. On the other hand, dental malocclusion showed the following: 30% of class I, 56% class II division 1, and 6% class II division 2, in the meantime class III scored 8%. Subjective assessment using IOTN was not part of the present implemented protocol. Laboratory request forms were present and filled for 94% of patients, and 90% of laboratory work was received. Study models were taken for 94% of patients, other 6% of patients still waiting to complete diagnostic and collecting records. Extra and intra-oral photographs were taken for 74%. While 4% of patients refused the extra-oral photographs, on the other hand, 22% of patients are still waiting to take photographs.

DISCUSSION

Using an audit to increase the quality of patient care is not a new concept and people should receive all needed healthcare with acceptable quality.⁴ The audit gradually becomes an important tool to develop and improve the quality of physical, mental and social wellbeing. There is a great debate in defining the terms audit and clinical research. Clinical research aims to study a clinical practice to discover new information and knowledge, and generate evidence to support a hypothesis. It could be observational, interventional, non-interventional or prospective, retrospective, qualitative, and quantitative.¹⁰⁻¹³ On the other hand, audit seeks to enhance and improve health care. Audit has no end, it could be repeated to confirm that the change and improvement are continuing.¹⁰⁻¹³ Thus, the aim of this audit was to assess the quality of clinical record keeping in clinical practice of the Orthodontic Department at the Faculty of Dentistry, University of Benghazi.

The results of this retrospective audit, noted that the patient identification form (full name, date of birth and contact details) was taken by 100%. On the other hand, it was observed that recording medical history was not sufficient. This lacking of details could be overcome by adding the medical history questionnaire for each patient to fill and sign. Afterwards the orthodontist could revise the questionnaire and request any further clarification from the patients. Although 64% of patients referred to orthodontic department from different polyclinics, still 36% of patients came to the clinic without referral reports, this reflects the patients' awareness regarding orthodontic treatment.

The clinical examination gives an idea about how future orthodontic patients will maintain their oral hygiene. Whereas, 50% of patients have fair oral hygiene, and 38% with carious lesions. Accordingly, oral hygiene instructions should be intensively given to orthodontic patients with full explanation about the complications that could result from orthodontic appliances. This can be achieved through leaflets, posters and videos given to the patient while he waits in the waiting room.

Radiographs (lateral cephalogram and OPG) are used as routine diagnostic records, meanwhile, 8% of patients were asked to take either OPG or lateral cephalogram to ensure a certain diagnosis that does not justify the use of both, for example in case of serial extraction with class I malocclusion, commonly it needs OPG only in the early diagnosis, and this reflects the care that the orthodontist can provide to the patient. In some cases as impacted canines or central incisors, in addition to cleft lip and palate, it is recommended to use three dimensional radiograph (Cone beam computed tomography) which will reveal accurate information regarding the position and angulation of the impacted tooth. Furthermore, evaluate the quality of bone and ankylosis if present. These information will help in developing case specific treatment planning.

The results clarify that there was no use of written informed consent about the treatment plan and a cost estimate form, there was use of a verbal consent only which should be substituted with written consent as it is important for legal consideration if required. On the other hand, as the Dental Faculty is a government institution, using the cost estimate form was not allowable because it offers free public services.

This audit gives an idea about the percentage of skeletal and dental malocclusions. The diagnosis and data collection showed class II malocclusion is the most frequently observed. This finding is in

agreement with the reported percentage of class II malocclusion among school children in Benghazi.¹⁴ This sample of Libyan subjects showed that the Orthodontic Department was not implying the IOTN to justify the treatment of the patient at the orthodontic clinic.

Laboratory request forms were found in the records of 94% of patients, while the laboratory work was received in 90% of the cases, which reflects the ineptitude of offering the requested appliances. Although taking an impression is considered an important step for orthodontic patients, it is recommended to fund the department to provide an intra-oral scanner that assists in making digital intra-oral impressions. This will save storage space of the study models, working in a cleaner, less chaotic environment, and facilitate communication between the department and the laboratory. Furthermore, using the oral scanner can be used in explaining the type of malocclusion and treatment plan.

A partial collection of photos existed because 22% of the patients had not yet had their pictures taken. As a result, instructions should be provided to collect patients' photos during clinical examinations while collecting the whole patient data.

A recommendations' document has been submitted to the department of Orthodontics for further discussion and implementation when required. Re-auditing of the collected data is proposed to be performed after six months.

Recommendations

- Medical history questionnaire for each patient.
- Oral hygiene instructions should be given to orthodontic patients.
- Written informed consent should be obtained from each patient.
- Fund the dental faculty to provide three dimensional diagnostic aids such as intra-oral scanner and cone beam computed tomography.

CONCLUSION: This self-audit highlights the shortcomings in the collected records. Therefore, extra effort should be applied to improve the quality of clinical records keeping in the clinical practice of orthodontics through the implementation of the changes that were recommended.

Furthermore, this procedure showed how an audit can be performed in any area of orthodontics and dentistry to improve the quality of patient care.

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