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Knowledge and Attitude of Cone Beam CT- A Questionnaire Based Study among Saudi Dental Students

Reham F. Al Noaman[1] and Sara M. El Khateeb[2,3*]

[1]College of Dentistry, Taibah University, Al-Madinah Al Monwarah, KSA.
[2]Department of Oral Medicine, Periodontology, Diagnosis and Oral Radiology, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.
[3]Department of Oral and Basic Clinical Sciences, College of Dentistry, Taibah University, Al-Madinah Al Monwarah, KSA.

Authors' contributions

This work was carried out in collaboration between both authors. Author RFAN distributed the questionnaire among students, collected the data and statistically analyzed it, wrote the introduction and results. Author SMEK designed and managed the analysis of the study, wrote the discussion and conclusion, organized references and prepared the manuscript for submission. Both authors read and approved the final manuscript.

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ABSTRACT

Aims: The aim of this study was to assess the knowledge and attitude of cone-beam computed tomography (CBCT) among undergraduate (UGS) and postgraduate (PGS) Saudi female dental students in College of Dentistry, Taibah University, Al-Madinah Al Monwarah.
Study Design: Observational cross-sectional study.
Place and Duration of Study: College of Dentistry, Taibah University, Al-Madinah Al Monwarah, Saudi Arabia, between January 2016 till October 2016.
Methodology: This study incorporated 108 female dental students. The information was assembled through an online anonymous pre-prepared questionnaire consisted of 15 structured

**Corresponding author: E-mail: saraelkhateeb77@gmail.com;*

close-ended questions. Descriptive statistics calculated in terms of frequencies and percentages by Chi-Square test.

Results: Our study showed that the majority of participants knew CBCT (93.8%). Awareness of CBCT was nearly similar between UGS (92.9%) and PGS (100.0%). The highest percentage of participants (67.9%) acquired information about CBCT from faculty lessons. Only three (3.7%) did not work with digital radiography. Most of the UGS agreed that the faculty provided adequate education regarding CBCT (70%), in contrast with PGS who disagreed (90.9%). 86.4% of contributors supposed it is needed for CBCT to be available at dental faculties. There was a high satisfaction of using CBCT amongst UGS (78.6%) and PGS (90.9%).

Conclusion: The study participants' responses reflect the importance of CBCT in the dental field. Nevertheless, the study necessitates that dental school curriculum should include adequate CBCT practical training and its integration with other clinical courses to improve students' basic knowledge and interpretation regarding this recent technology.

Keywords: Knowledge; attitude; CBCT; Saudi; dental students.

1. INTRODUCTION

Cone-beam computed tomography (CBCT) is an outstanding three-dimensional (3D) dental and maxillofacial imaging modality that developed in recent years [1]. It depends on multiplanar reformation process that has distinct advantages such as, reducing the size of the irradiated area, image exactness, fast scan time, unique modes of maxillofacial imaging and reduced image errors [2].

As well as, CBCT has numerous significant applications in dentistry, including jaw bone valuation for placement of dental implants, orthodontic treatment planning, and assessment of the temporomandibular joints for deteriorating osseous changes. As well as it is used for estimation of the nearness of mandibular third molar teeth to the mandibular canal previous to extraction, and valuation for signs of infection, cysts and tumors [3], dentoalveolar trauma, cleft lip, cleft palate and endodontic review [1]. CBCT weaknesses comprise beam hardening and scatter from dental materials and little soft-tissue contrast [4].

CBCT scanners function by directing a cone-shaped X-ray beam on a two-dimensional (2D) sensor that revolves nearly 360 around the patient's head to yield a sequence of 2D images. A cone beam algorithm then done on this data set, permitting the operator to extract multiplanar reconstructions of variable thicknesses in any plane and to produce precise three-dimensional (3D) images of bone and soft-tissue surfaces [5,6].

Unfortunately, there is a lack of sound knowledge about CBCT technology advantages and applications among general dentists and dental students. Traditional dental education had dedicated on teaching plain two-dimensional imaging. The inclusion of CBCT in the oral radiology curriculum is an absolute requirement to formulate future dental practitioners to apply three-dimensional imaging appropriately for diagnosis and treatment planning. Thus, there is an urgent need to conduct studies measuring the level of knowledge and attitude towards CBCT among dental students [7].

Dental students will be future dentists who should be acquainted with the modern digitized radiological techniques including CBCT, taking into consideration the increased implication of CBCT in dental practice; it appears that the assessment of dental students' awareness for CBCT is essential. There are only very few studies reported in the literature regarding the knowledge and attitude of dental students toward new oral radiographic imaging [3,8]. In 2013, study conducted in India informed that 58.3% of postgraduates, 1.7% of fourth years and 12.5% of fifth years were familiar with CBCT [8]. Although, another study made in Turkey stated that the majority of students knew about CBCT [3].

Therefore, the aim of the present study was to assess the knowledge and attitude towards CBCT among undergraduate and postgraduate Saudi female dental students at Taibah University, College of Dentistry, Al-Madinah Al Monwarah, Saudi Arabia.

2. MATERIALS AND METHODS

This observational cross-sectional study conducted in Taibah University, College of Dentistry, AL Madinah AL Monowarah, Saudi

Arabia. A self-administered anonymous questionnaire [8,9] consisted of 15 close-ended questions designed and administered voluntarily to 108 female dental students (90 undergraduates in clinical years and 18 postgraduates), between January and March 2016, the survey form e-mailed to the students. We excluded first and second preclinical year dental students, as their curriculum did not include CBCT. Only entirely filled questionnaires taken into consideration. The first question concerned with the student's educational level and the remaining questions related to CBCT awareness, advantages, applications, and uses (Fig. 1).

The questionnaire assessed general knowledge and attitudes towards CBCT among undergraduate and postgraduate Saudi female dental students.

Knowledge and attitude of Cone-Beam CT among Saudi Dental students

1- Education level: 1.third year( )2.fourth year( ) 3.fifth year( ) 4.post-graduate( ).

2- Are you aware of cone beam computed tomography used for dentomaxillofacial region?

a) Yes ( ) b) No ( ) ,If yes proceed to next question.....

3-How did you obtain information regarding CBCT (multiple responses are allowed)

a) Faculty lessons ( ) b) seminars ( ) c) internet ( ) d) others ( )

4-Did you attend any courses related to CBCT? a) Yes ( ) b) No ( ).

5-Do you use digital imaging technique for taking radiograph? A) yes ( ) b)No ( ).

6- Please check the reasons of using digital imaging technique,

a) Radiation dose is much less ( ) ,b) It takes a short time to perform ( ), c) There's no developing process ( ) ,d) There's no wastage in developing process and does not cause pollution ( ), e) It's easy to store images ( ) ,f) Adjustment and measurement can be done on images ( ) ,g) There're no artifacts related to developing process ( )

7- Please check the reasons of not using digital imaging technique,

a)Expensive ( ) b)Poor image quality( ) c)Do not have essential equipment ( ) d) Don't know how to use computer ( ) e) I have no idea ( ) f) hard to perform ( )
g) some technical problems might occur during the storage of imaging ( )

8- For what cases would you choose to use CBCT?

A. Implant dentistry ( ) ,B. Extraction of impacted teeth ( ),C. Evaluation of patients with tumors or cysts ( ),D. Orthodontic assessment ( ),E. All the above ( ),F. Other ( ) G. No need ( )

9-choose from the following advantages of CBCT over medical CT:

A. Lower radiation dose ( ), B. Shorter scanning time ( ),C. Less expensive ( )

D. Occupies less space ( ) ,E. Easier to maintain ( ), F. Image processing is easier due to the limited beam ( )

10-Have you ever referred your patients for CBCT imaging? A. Yes ( ) B. no ( )

11- To what extent do you think CBCT will be used in routine dental practice in near future?

A. In all areas of dentistry ( ), B. For selected dental applications ( ), C. It will not be commonly used in routine practice ( ), D. No idea ( )

12- Do you think it is necessary for a CBCT unit to be available at your specialty? A. Yes ( ) B. No ( ) C. No idea( )

13- Which year of dental education should include lectures on CBCT?

A. Preclinical phase ( ), B. Clinical phase ( ), C. Doctoral phase ( ), D. There is no need

14-Does your faculty provide adequate education regarding CBCT? A. Yes ( ) B. No ( ) C. No idea ( )

15- Are you satisfied with the use of CBCT? A. Yes ( ) B. No (

Fig. 1. The study questionnaire

2.1 Statistical Analysis

Data collected from electronic questionnaires then coded. We used Statistical Software package SPSS program version 16 for data analysis. The difference in the student's response according to education level assessed using a chi-square test for quantitative data. A significance level was set at $P \leq 0.05$. Descriptive statistics calculated in terms of frequencies and percentages.

3. RESULTS AND DISCUSSION

108 Saudi female dental students in College of Dentistry, Taibah University, received the questionnaire to participate in the study; the response rate was 75%, as 81 students participated from 108 students. Hence overall 81 questionnaires were analyzed, which mainly constituted of undergraduates (UGS) including 3rd years (n=36, 44.4%), 4th years (n=14, 17.3%) and 5th year (n=20, 24.7%), Postgraduates (PGS) (n=11, 13.6%).

The majority of participants had awareness about CBCT and it was nearly similar among UGS (n= 65, 92.9%) and PGS (n= 11, 100.0%), with no significant difference *(P* = 0.360). The highest percentage of all participants (88.9%, n=72) acquired information about CBCT from faculty lessons, and the least percentage were from seminars. There was no significant difference between UGS and PGS answers except for internet option (*P* = 0.01*) (Table 1).

No one in PGS attended courses related to CBCT while (34.3%, n=24) from UGS attended related courses. There was statistically significant difference (*P*=0.021*) between their responses. Out of 81 participants, only three (3.7%) did not work with digital radiography. All 5th year students and postgraduates preferred digital imaging in their work. Furthermore, (94.4%, n=36) of 3rd year and (92.9%, n=14) of fourth years are also using digital imaging. There was no statistically significant difference between UGS and PGS regarding using digital imaging technique (*P* =0.57).

The majority of applicants selected that the most common reason for using digital imaging was that adjustment and measurements could be done on images (n=62, 76.5%) followed by easy image storage (n=60, 74.1%) while the least common reason was absence of artifacts related to developing process (n=33, 40.7%). There was no statistically significant difference between answer of UGS and PGS in all choices (Table 2).

More than half of UGS decided that the most prevalent reason for not using digital image was the expensive price (55.7%, n=39) and the least for do not know how to use a computer or hard to perform the image (2.9%, n=2). In comparison with PGS, the most common reason was some technical problems might occur during the storage of imaging and the least for poor image quality. Furthermore, there was a significant difference between replies of UGS and PGS (p= 0.025*) (Table 3).

Remarkably, the highest percentage among UGS nominated to use CBCT for dental Implant (95.7%, n=67), and the least decided that no need to use CBCT in any cases (54.3%, n=38). Compared to PGS the peak percentage chosen to use CBCT for evaluation of patients with tumors or cysts, extraction of impacted teeth and Implant dentistry (100%, n=11), and the least indication was for orthodontic assessments (45.5%, n=5). There was no significant difference in their responses (*P*=0.16). Regarding advantages of CBCT over medical CT, the most significant advantage among UGS and PGS was less radiation dose (60.5%, n=49) followed by short scan time (43.2%, n=35) and the least important was less expensive (4.9%, n=4). There was no significant difference between reactions of UGS and PGS concerning CBCT advantages.

Only 37.1% of UGS (n=26) like to refer their patients to CBCT imaging and nearly all PGS like to refer (90.9%, n=10). There was a significant difference between responses of UGS and PGS (*p*=0.001*). Most UGS and PGS selected that CBCT will used in selected dental applications (68.6%, n=48) UGS, (81.8%, n=9) PGS. There was no significant difference between them (*P*=0.572) (Table 4).

61 of UGS (87.1%) and 9 of PGS (81.8%) preferred the necessity of CBCT availability at specialty, there was a significant difference *(P*=0.014*). 41.4% of UGS (n=29) prefer that CBCT lectures should be in clinical years of Dental education while (58.6%, n=41) chosen preclinical. In comparison to (90.9%) of PGS picked clinical and (9.1%) selected preclinical. There was a significant difference between responses (*P*=0.002*).

Table 1. Sources of information regarding CBCT

How did you obtain information regarding CBCT?	3rd year	4th year	5th year	PGS	UGS	P value
Faculty lessons	32 (88.9%)	14 (100.0%)	16 (80%)	10 (90.9%)	62 (88.5%)	0.33
Seminars	0 (0%)	1 (7.1%)	1 (5%)	1 (9.1%)	2 (2.9%)	0.41
Internet	1 (2.8%)	5 (35.7%)	2 (10%)	3 (27.3%)	8 (11.4%)	0.01*
Others	6 (16.7%)	0 (0%)	3 (15.0%)	1 (9.1%)	9 (12.9%)	0.4

Table 2. Reasons for using digital radiography

The reasons for using digital imaging?	Radiation dose is much less	It takes a short time to perform	There is no developing process	There is no wastage in developing process	It is easy to store images	Adjustment and measurement can be done on images	No artifact
UGS	46 (65.7%)	50 (71.4%)	49 (70%)	45 (64.3%)	52 (74.3%)	52 (74.3%)	30 (42.9)
PGS	9 (81.8%)	8 (72.7%)	8 (72.7%)	6 (54.5%)	8 (72.7%)	10 (20.9%)	3 (27.3%)

Table 3. Reasons for not using digital image

The reasons for not using digital imaging technique	Expensive	Poor image quality	Do not have essential equipment	Don't know how to use computer	I have no idea	Hard to perform	Some technical problems might occur during the storage of imaging
UGS	39 (55.7%)	5 (7.1%)	4 (5.7%)	2 (2.9%)	12 (17.1%)	2 (2.9%)	6 (8.6%)
PGS	2 (18.2%)	0 (0%)	1 (9.1)	0 (0%)	2 (18.2)	1 (9.1%)	5 (45.5%)

Table 4. Using CBCT in routine dental practice in near future

To what extent do you think CBCT will be used in routine dental practice in near future	In all areas of dentistry	For selected dental applications	It will not be commonly used in routine practice	No idea
UGS	11 (15.7%)	48 (68.6%)	7 (10.0%)	4 (5.7%)
PGS	2 (18.2%)	9 (81.8%)	0 (0%)	0 (0%)

Most of the UGS agreed that the faculty provided adequate education regarding CBCT (70%, n=49) in contrast with PGS who mostly disagreed (90.9%, n=10). There was a significant difference between responses *P*=0.01* (Fig. 2). There was a high satisfaction of using CBCT amongst UGS (78.6%, n=55) and PGS (90.9%, n=10). There was no significant difference *(P*=0.339) (Fig. 3).

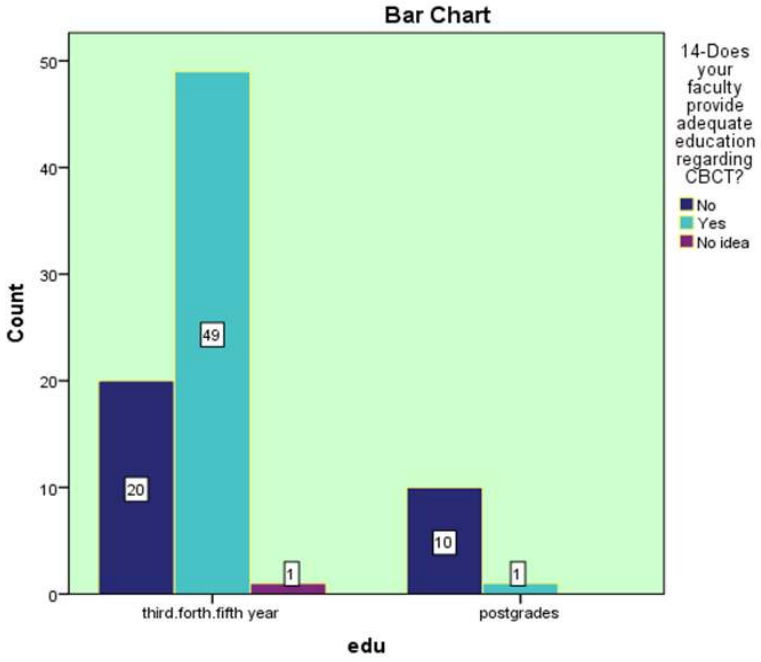

Fig. 2. Bar chart is showing the difference in response between UGS and PGS regarding adequate faculty CBCT education

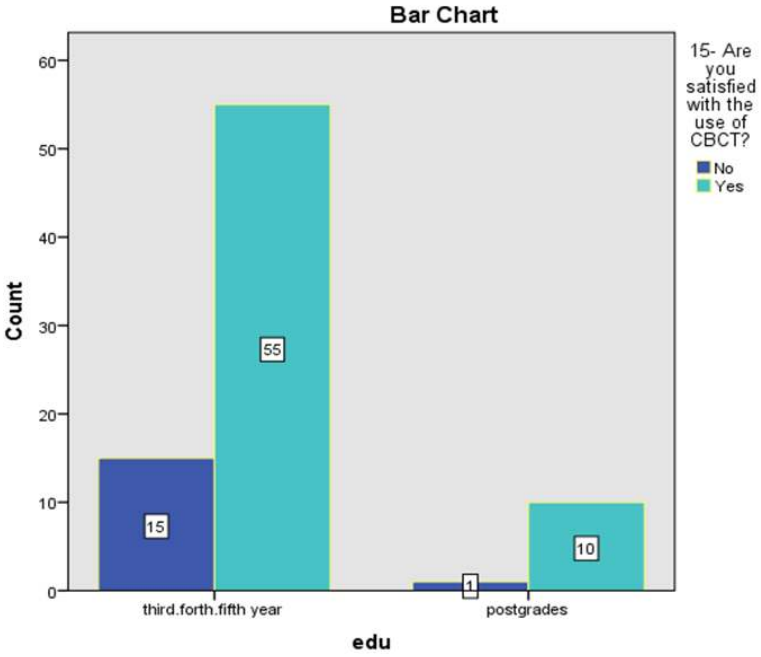

Fig. 3. Bar chart is showing the difference in response between UGS and PGS regarding satisfaction with CBCT use

3.1 Discussion

The use of CBCT in the dental field is growing throughout the world due to its efficiency in a diversity of diagnostic purposes as reported in the previous literatures [1]. Previous studies only evaluated dental students' knowledge regarding digital approaches and radiation protection [10,11]. Despite CBCT importance, very few studies assessed dental student's knowledge and attitude towards it. Therefore, the present study used a questionnaire to evaluate CBCT knowledge and attitude among Saudi Female dental undergraduate and postgraduate students of College of Dentistry, Taibah University, Saudi Arabia.

We found that the majority of contributors had received about CBCT (93.8%, n=76) while (6.2%, n= 5) had not. Awareness of CBCT was nearly similar among UGS (92.9%) and PGS (100%), and there was no significant difference between their responses regarding CBCT awareness. This result was in accordance with another study made in Turkey where the majority of participating dental students had heard of CBCT. Awareness of CBCT was identical between the fifth year and PGS but higher than fourth year students for Ankara University. While Gazi University showed that awareness of CBCT among PGS is more than UGS (*P*= 0.00) [3].

Our study reported that the highest percentage of participants (88.5%, n=62) from UGS and (90.9%, n=10) from PGS acquired information about CBCT from faculty lessons only, and the least percentage were from seminars or Faculty lessons and internet (1.2%, n=1). This outcome was in disagreement with Kamburog˘lu K et al. [3] study which stated that more than half of PGS (59.6%) had educated about CBCT from seminars, compared with only (3.3%) UGS. In agreement with our results, the majority of UGS (87.5%) in the previous study educated about CBCT in faculty lessons, compared with only (31%) PGS.

Regarding advantages of CBCT over medical CT, we found that the most important advantage among UGS and PGS was less radiation dose (60.5%, n=49) followed by short scan time (43.2%, n=35) and the least important was less expensive (4.9%, n=4). This conclusion was in harmony with the previous study in Turkey [3] who affirmed that low radiation dose assumed as the most significant advantage of CBCT (61.7%) while easier maintenance was the least important advantage (22%) in disharmony with our results. Although CBCT has less radiation dose correlated to the medical CT, former researchers [12,13,14,15] reported that the effective dose of CBCT is several to hundreds of times more than the effective dose from plain two-dimensional dental imaging techniques.

Li G. [16] described that the effective dose of CBCT differs from scanner type to another. CBCT dose strictly linked to the exposure factors used for scanning; for any CBCT machine, the greater the Field of View (FOV) and the higher spatial resolution used for imaging, the higher the effective dose consequently when all the other exposure factors are at the same level.

In the present study, most of the UGS agreed that the faculty provided adequate education regarding CBCT (70%, n=49) in contrast with PGS, who mostly disagreed (90.9%, n=10). This difference in responses between UGS and PGS attributed to lack of CBCT equipment in the faculty during study years of PGS, unlike UGS where the facilities and recent equipment including CBCT were available. In dissimilarity to our UGS results Kamburog˘lu K et al. [3] found the majority of both UGS (70.8%) and PGS (83.3%) stated that the faculty courses did not deliver suitable information about CBCT.

In the existent study, almost half of the students 51.9% thought that CBCT lectures should be in preclinical years while 48.1% selected clinical years. This result was in contrast to another study in Turkey where the majority of students (69%) thought that info on CBCT should involve in clinical lectures, whereas 7.7% said they should include in pre-clinical lectures [3].

86.4% of students in the current study preferred the necessity of CBCT availability at specialty, and this was very near to Kamburog˘lu K et al. [3] who found that the majority of participants (91%) said they wanted a CBCT unit at their faculty.

The American Academy of Oral and Maxillofacial Radiology (AAOMR) stated in a distinct opinion that dentists who use CBCT in their practices must have a thorough knowledge of head and neck anatomy radiographically, as well as the ability to recognize normal variants and disease. Consequently, the new tendency of teaching CBCT in oral radiology courses should acquaint students with three-dimensional anatomy and prepare them to interpret and investigate these scans during their dental work [17].

Also, the dental students in the preclinical years should learn the basic information and clinical applications regarding CBCT in different dental disciplines while the postgraduates should apply and use CBCT following the guidelines and clinical commendations of (AAOMR) for each dental specialty. AAOMR stated that CBCT should be made only by a properly licensed physician or certified radiologic operator. CBCT examinations should be made lonely for effective diagnostic or treatment causes and with the least exposure essential for acceptable image quality [17].

Although many problems and shortcomings associated with any survey methodology for assessment of students' knowledge and attitude. This type of research remains the best method of evaluating educational programs in the short term [8]. Up to our knowledge, our study considered the first CBCT survey to be done among Dental Students in Saudi Arabia. Nevertheless, it is recommended that further studies conducted on a larger sample.

4. THE LIMITATION OF OUR STUDY

The main limitation was that our Dental College is recent and only one female patch was graduated, and this explains why only 18 PGS participated in the study.

5. CONCLUSION

The study participants' responses reflect the importance of CBCT in dentistry. Nevertheless, the study necessitates that dental school curriculum should include adequate CBCT practical training and its integration with other clinical courses to improve students' basic knowledge and interpretation regarding this recent technology.

ETHICAL APPROVAL

Taibah University College of Dentistry Research Ethics Committee (TUCD-REC) approved this study on February 2016 (Appendix 1), an informed consent was involved at the beginning of the questionnaire, and students who only agreed to fill the questionnaire participated in the study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX 1

Kingdom of Saudi Arabia
Ministry of Education
Taibah University
College of Dentistry
Research Ethics Committee
TUCD-REC

المملكة العربية السعودية
وزارة التعليم العالي
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كلية طب الأسنان
لجنة أخلاقيات البحوث

29th February 2016
TUCDREC/20160204/Al Noaman

Dear Reham Foad AL Noaman
Dental Student
College of Dentistry - Taibah University

Please be advised that Taibah University, College of Dentistry Research Ethics Committee (TUCD- REC) has Reviewed the protocol titled:

Knowledge and Attitude of under/post graduate dental students towards Cone Beam Computed Tomography in AL Medina AL Monowarah

Co- Investigators

TUCD-REC has decided the following for your protocol:

☒ Unconditional Approved
☐ Conditional Approved
☐ Deferred
☐ Rejected

You may not initiate changes in approved research protocol without TUCD-REC Review and approval except when necessary to eliminate apparent immediate hazards to study subjects

TUCD REC is organized and operated according to the Saudi National Regulation of the National Bioethics Committee, Guidelines of the Declaration of Helsinki, International Conference of Harmonization ICH, and United States Codes of Federal Regulations and registered in the office of Human Research Protection under the IORG #: IORG0008371 which Expires on :13 January 2019, FWA00023781 which Expire on 13 January 2021, IRB# 00010037

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