

Biomedical Waste Management among Dental Health Care Personnel during the COVID-19 Pandemic: Questionnaire Validation and Preliminary Results

Maryam Khader Alghamdi^{1*}, Khalid Aboalshamat², Raneem Alahdal³, Sarah Alzanbaki³, Maha Alzahrani⁴, Wjoud Albishi⁵, Wejdan Salman⁵ and Rana Alsulimani⁴

¹Department of Dentistry, General Dentist, Umm Al-Qura University, Makkah, Saudi Arabia

²Department of Preventive Dentistry, Dental Public Health Division, Faculty of Dentistry, Umm Al-Qura University, Makkah, Saudi Arabia

³Department of Dentistry, Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia.

⁴Department of Dentistry, General Dentist, Alfarabi College, Jeddah, Saudi Arabia

⁵Department of Dentistry, General Dentist, Ministry of Health, Riyadh, Saudi Arabia

***Corresponding Author:** Maryam Khader Alghamdi, Department of Dentistry, General Dentist, Umm Al-Qura University, Makkah, Saudi Arabia.

Received: November 27, 2020; **Published:** January 18, 2021

Abstract

Introduction: Dental waste is considered hazardous biomedical waste (BMW), and it generates different types of materials. The importance of management of BMW has been accentuated by the COVID-19 pandemic. This study aimed to validate a questionnaire assessing the knowledge, attitudes and practices around BMW management among dental health care personnel during the COVID-19 pandemic.

Methods: This cross-sectional study involved 159 dental students and dentists in Saudi Arabia who were recruited via online questionnaire. The questionnaire was first validated through piloting. T-tests, linear regressions, chi-square, and ANOVA were used for statistical analyses, and statistical significance was set as a probability value of less than 0.05.

Results: The mean of the participants' total knowledge score was 6.04 (standard deviation = 2.10) out of 14 questions. About 79.9% were aware that BMW management rules apply to dentists. However, only 6.9% knew how to dispose of a radiographic lead foil. Knowledge levels were significantly higher (0.048) among dentists than dental students. Between 84.9% and 91.8% of respondents think BMW training is important, should be a compulsory undergraduate course and became more important during the COVID-19 pandemic.

Conclusion: The questionnaire has been validated and can be used to assess dental BMW awareness. The level of BMW knowledge in Saudi Arabia is low and needs reinforcement among dental students and dentists.

Keywords: Biomedical Waste; Dental Waste; COVID-19; Health Care; Dentist; Dental Intern

Introduction

With civilization's advances in medical technology, a greater share of the population has access to health care sectors than in the past. But the increased number of health care establishments also leads to increases in the waste they generate, referred to as health care waste [1] or biomedical waste (BMW). This waste has a much greater potential for being infectious than any other type of waste [2,3] and the health care sector produces a tremendous volume of BMW in the course of curing diseases [4]. BMW can be defined as any solid, liquid, or fluid waste, including the waste container and any intermediate products generated during the diagnosis, treatment, or immunization of animals or human beings in any medical activity, including at research centers, in testing, or in the production of animal or biological waste [5,6]. BMW can be classified into two categories according to its characteristics: general health care waste represents approximate-

ly 75 - 90% of the total volume of BMW and hazardous waste represents the remaining 10 - 25% [3,7]. The latter can be further subdivided into six classes: infectious, sharps, pathological, chemical, pharmaceutical (cytotoxic) and radioactive [3,7].

Dental waste is considered hazardous BMW, and it generates different waste materials, including sharps, infectious wastes (blood-soaked gauze, cotton, etc.) disposable items, chemical waste (e.g. fixers, disinfectants, spent film developers), waste that contains lead (e.g. lead aprons, lead foil packets), waste containing mercury (e.g. amalgam scrap) [8,9]. If the amalgam manipulation and its waste products are not strictly regulated, it could be responsible for occupational exposure as well as environmental pollution [10]. Dental waste also can have two types of potentially negative effects-on the health of the person handling the waste and on the environment [11]. A proper mechanism should be engineered to collect, store, transport and dispose of hazardous dental waste to avoid serious public health consequences [3]. The risk group includes doctors, nurses, hospital staff, auxiliaries and workers disposing of and handling such waste. Health care facilities should execute strict regulations and rules, with proper staff training. In dental school, students are involved in the generation of BMW [3,12,13], so it is important that they have proper knowledge of the guidelines and proper practices of BMW management protocol [12,14,15].

Further, many studies have investigated the levels of knowledge, attitudes, and practices of dental students and practitioners regarding BMW management [8,16-28] and globally, this topic has been frequently investigated, particularly in India. In fact, one study in India showed that dental students and practitioners have a satisfactory level of awareness about BMW in general [16]. Other studies have suggested that dental students and practitioners have an acceptable level of knowledge about dental BMW, but they also indicated that BMW management should be improved due to a lack of proper practices and attitudes toward the handling of this waste [8,17-21]. Conversely, there are other studies that criticize the poor levels of knowledge, bad attitudes, and poor practices regarding BMW management and that there is a crucial need for further education of both dental students and dental practitioners about the hazards associated with improper waste disposal among all levels of dental personnel [22,23]. A study in Jeddah, Saudi Arabia, indicated that dentists have low knowledge levels and substandard management of dental wastes, despite 33.4% receiving official training on waste management [24]. However, there is a lack of similar studies focused on dental students in Saudi Arabia.

Recently, the COVID-19 pandemic has affected all countries [25] around the world and has required many new precautions to be taken for infection control [26] and even different protocols for waste management [27]. These changes extend into dental practices. For example, any material used for treating a patient who is suspected of or confirmed as having COVID-19 should be disposed of as biohazards [28]. Such updated awareness and information should be a priority during any pandemic. Nevertheless, during the recent COVID-19 pandemic, such knowledge has not yet been assessed. Indeed, BMW management is one of the most important factors that dental personnel need to be aware of because it may very well be a source of infection transmission.

Aim of the Study

The aim of this study was to validate a questionnaire for assessing the levels of knowledge, attitudes and practices related to BMW management among dental health care personnel during the COVID-19 pandemic in Saudi Arabia.

Methodology

This cross-sectional study employed a questionnaire to assess the knowledge, attitudes and practices about BMW management among dental health care personnel during COVID-19 in Saudi Arabia. A convenience sampling technique was used to recruit participants from all over the country, using social media platforms (i.e. Instagram, Twitter, Snapchat, WhatsApp, ResearchGate and Facebook). This was necessitated by the social distancing requirements in Saudi Arabia during the data collection period, which was from October to November 2020. The inclusion criteria were Saudi Arabian dental students, interns and dentists, whether or not they were currently working. Criteria for exclusion included a participant who was unwilling to sign the informed consent document. Using a sample size calculation

with a 5% level of precision, a confidence level of 90%, and an estimated prevalence of 50%, the minimum number of participants needed for this study was 385. To overcome a further estimated 40% non-response rate, the research team distributed 580 self-administered online questionnaires in English. Participants answered anonymously and voluntarily at their convenience. The informed consent was embedded at the beginning of the questionnaire, and participants indicated their agreement with the informed consent by answering the questionnaire. Completing the questionnaire took approximately 3 to 5 minutes.

The questionnaire used in this study was derived from two validated questionnaires used in previous studies [8,24]. A pilot test was carried out to validate the questionnaire by having 10 participants complete it and evaluate the questions in terms of syntax, order, organization, content, logical sequence, grammar, and clarity of meaning.

The questionnaire consisted of 24 questions organized in two parts: the first part gathered personal demographic data with regard to gender, age, city of residence, nationality, type of practice, marital status and current year of study. The second part encompassed subsections that included questions assessing the participants' knowledge, attitudes and practice routines regarding BMW management through 14 multiple-choice questions, each with one correct answer. The total knowledge score was calculated as the sum of the scores on the individual knowledge questions. The next subsection investigated attitudes with four yes/no questions, and finally, practice protocols were assessed with six multiple-choice questions with a single correct answer. As with the knowledge score, the total practice score was the sum of the scores on each question. All the previous sections contained questions related to COVID-19 waste management.

The data were collected and analyzed using version 21 of the SPSS program (IBM Corp., Armonk, NY, USA). T-tests, linear regressions, the chi-squared test and ANOVA were used for statistical analysis, and a probability value of less than 0.05 was set as statistically significant. Before conducting the study, ethical approval was obtained from the institutional review board (IRB) of Umm Al-Qura University, Faculty of Dentistry.

Results

In this study, 159 participants answered the research questionnaire. The mean age of the participants was 26.44 years, with a standard deviation (SD) of 3.03. The data collected on gender, region, nationality, marital status and qualification details are provided in table 1.

Variables		Number (N)	Percent (%)
Gender	Male	39	24.5%
	Female	120	75.5%
Region	Central	40	25.2%
	West	84	52.8%
	East	28	17.6%
	South	3	1.9%
	North	4	2.5%
Nationality	Saudi	141	88.7%
	Non-Saudi	18	11.3%
Marital status	Married	48	30.2%
	Non-Married	111	69.8%
Qualification	Dental student	54	34.0%
	Dentist	105	66.0%

Table 1: Demographic data.

Participants were asked 14 questions to assess their level of knowledge about BMW (See table 2). Each question had only one correct answer, yielding a range of possible scores of zero to 14, which was the highest possible score, and the correct answers were added to the total knowledge score. After adding those scores, the mean of participants' total knowledge score was 6.04 (SD = 2.10).

Questions	Answers	Number of responses (%)
1. Are all health care wastes hazardous?	Yes	52 (32.7%)
	No*	86 (54.1%)
	I do not know	21 (13.2%)
2. Are you aware that BMW management rules are applicable to dentists?	Yes*	127 (79.9%)
	No	15 (9.4%)
	I do not know	17 (10.7%)
3. Can any plastic bag be used for waste disposal?	Yes	44 (27.7%)
	No*	102 (64.2%)
	I do not know	13 (8.2%)
4. Are you aware of amalgam separators?	Yes*	112 (70.4%)
	No	30 (18.9%)
	I do not know	17 (10.7%)
5. Is waste generated from the treatment of known or suspected COVID-19 patients considered biohazard wastes?	Yes*	114 (71.7%)
	No	17 (10.7%)
	I do not know	28 (17.6%)
6. According to international guidelines, what is the maximum length of time that BMW can be stored during the summer?	24 hours	43 (27%)
	48 hours*	16 (10.1%)
	72 hours	4 (2.5%)
	I do not know	96 (60.4%)
7. Where should excess silver amalgam be stored?	Dispose of it in a common bin	12 (7.5%)
	Store it in fixer solution*	32 (20.1%)
	Store it in an airtight container with water	40 (25.2%)
	I do not know	75 (47.2%)
8. Where do X-ray film lead foils get discarded?	The common bin	32 (20.1%)
	Sold to certified buyers*	11 (6.9%)
	Stored and disposed of in separate container	52 (32.7%)
	I do not know	64 (40.3%)
9. Where do exposed X-ray films get discarded?	Stored separately and disposed of in common bin	39 (24.5%)
	Disposed of in secured landfill*	41 (25.8%)
	I do not know	79 (49.7%)
10. Where do orthodontic wires and brackets get discarded?	Deformed and disposed of in common bin	29 (18.2%)
	In a sharp's container with 1% sodium hypochlorite*	90 (56.6%)
	I do not know	40 (25.2%)

11. Where do developer and fixer solution get discarded?	Diluted and led into the sewer	58 (36.5%)
	Returned to the supplier*	24 (15.1%)
	I do not know	77 (48.4%)
12. Where do outdated and contaminated medicines get discarded?	Buried in soil	26 (16.4%)
	Disposed of in secured landfill*	72 (45.3%)
	I do not know	61 (38.4%)
13. Where does final dental care waste get discarded?	Corporate bin*	24 (15.1%)
	Certified collectors	63 (39.6%)
	I do not know	72 (45.3%)
14. How long are dental wastes kept before removal from the clinic/store area?	5 days or less*	110 (69.2%)
	More than 5 days	6 (3.8%)
	I do not know	43 (27%)

Table 2: Questions assessing knowledge about dental biomedical waste (BMW).

*Correct answer.

Attitudes toward BMW were determined through the four questions shown in table 3 and practice policies were assessed with seven questions, with a high score of 7 and a low of zero. The mean score of participants related to BMW practices was 3.93 (SD = 1.46). Details about participants’ answers are provided in table 4. In addition, table 5 gives the breakdown by variable of the participants’ total BMW knowledge and practice policy scores.

Attitudes toward dental BMW	Yes n (%)	No n (%)
1. Do you feel that BMW management should be made a compulsory part of the dental undergraduate curriculum?	146 (91.8%)	13 (8.2%)
2. Do you think your knowledge regarding BMW management is adequate?	41 (25.8%)	118 (74.2%)
3. Do you think you require any further training on BMW management?	135 (84.9%)	24 (15.1%)
4. Do you think the COVID-19 pandemic increased the required precautions when dealing with waste management?	138 (86.8%)	21 (13.2%)

Table 3: Attitudes about biomedical waste (BMW).

Questions	Answers	Number (%)
1. Did you receive any professional training on waste management?	Yes*	48 (30.2%)
	No	111 (69.8%)
2. Are you aware of any document outlining a policy for managing dental waste?	Yes*	83 (52.2%)
	No	76 (47.8%)
3. Are you aware of different color coding for different types of BMW?	Yes	98 (61.6%)
	No*	61 (38.4%)
4. Do you dispose of all kinds of waste in the clinic’s general garbage?	Yes	27 (17%)
	No*	132 (83%)
5. Did you receive any additional information/training on waste management with regard to COVID-19?	Yes*	54 (34%)
	No	105 (66%)
6. Where do you dispose of waste sharps?	Yellow plastic bag	54 (34%)
	Puncture-proof container*	103 (64.8%)
	General garbage	2 (1.3%)
7. Where do you dispose of waste generated by the treatment of known or suspected COVID-19 patients?	Yellow plastic bag*	108 (67.9%)
	Puncture-proof container	37 (23.3%)
	General garbage	14 (8.8%)

Table 4: Questions assessing the dental biomedical waste (BMW) practices of participants.

*Correct answer.

Variables Mean		Total knowledge			Total practice		
		SD	P-value	Mean	SD	P-value	
Gender	Male	6.08	2.241	0.915	4.31	1.379	0.062
	Female	6.03	2.066		3.82	1.472	
Region	Central	6.10	2.240	0.153	3.78	1.405	0.156
	West	6.31	2.106		4.10	1.502	
	East	5.43	1.854		4.00	1.247	
	South	4.00	1.732		3.00	2.000	
	North	5.75	1.500		2.50	1.732	
Nationality	Saudi	6.12	2.130	0.160	3.98	1.451	0.348
	Non-Saudi	5.44	1.822		3.61	1.539	
Marital status	Married	6.52	2.202	0.070	3.85	1.487	0.643
	Non-Married	5.84	2.034		3.97	1.455	
Qualification	Dental student	5.57	2.15	0.048*	4.09	1.58	0.358
	Dentist	6.28	2.040		3.85	1.39	

Table 5: Total biomedical waste (BMW) knowledge and practice scores in relation to demographic data.
*Significant difference.

Linear regression showed that age had no significant relationship with BMW total knowledge or practice policies.

Discussion

The results of our study indicate that dental students, interns, and dentists in Saudi Arabia have low levels of knowledge scores about BMW, and they correctly answered less than half of the knowledge questions. Dental students had lower BMW knowledge scores than dentists and dental interns. Around two-thirds of the participants were aware that BMW rules apply to dentistry, knew about amalgam separator, knew that COVID-19 wastes are considered biohazard materials, and knew that 5 days or fewer is the maximum duration that dental wastes should be kept before removing them from the clinic. Most of the participants did not know that in the summer, 48 hours is the maximum time that BMW should be stored, nor did they know they have to sell X-ray film lead foils to certified buyers, that developer and fixer solution should be returned to the supplier, or that the corporate bin is where dental care wastes should be discarded. Generally, participants had good attitudes about the importance of BMW, but their scores confirmed their lack of knowledge. Participant scores regarding correct BMW practices were little more than the midpoint. Participants from the governmental sector had higher scores on the correct practice procedures than those who were from private clinics, and dental students had lower BMW knowledge scores than dentists and dental interns.

Our results demonstrating poor levels of knowledge about dental BMW in Saudi Arabia are similar to the prior studies from Pakistan, South India and Jeddah, Saudi Arabia [22-24]. However, our results are contradictory to some other studies that found satisfactory or good levels of knowledge among dental students and dentists in India, Nepal and Puro [8,16-21]. This difference might be attributable to BMW management being part of the dental professional educational curriculum in India due to numerous studies focusing on this topic in India, which is in contrast to Saudi Arabian studies. However, further studies are needed to confirm this point. Another possible explanation for these contradictions is that many of the prior studies were conducted in India, where there has been significant attention paid to the adequate management of BMW. Conversely, this might be one of only a few studies to investigate BMW management among dental professionals in Saudi Arabia, indicating that the topic may not be a focus of stakeholders in Saudi Arabia. Nevertheless, more research is

needed to confirm if our results are due to cultural differences or are for other reasons. Our results show that dental students and dentists in Saudi Arabia need to undergo professional training on waste management, and it is an absolute necessity to develop and activate medical waste management programs, especially dental waste, and to ensure widespread awareness of proper methods of disposal. In fact, the results of this study should urge stakeholders in dental faculties to include curricula addressing the management of BMW in dental clinics in addition to dental hospital authorities including the topic in their medical education sessions. This is particularly important in light of the COVID-19 pandemic and the increased need for highly effective preventive and protective measures.

Positive attitudes about having BMW made a compulsory part of the dental undergraduate curriculum and further training on BWM were high (91.8% - 84.9%). Furthermore, the majority of our respondents believed that their knowledge on this topic is inadequate, which is similar to a previous study from India [8], reflecting the importance of the topic for dental students and dentists in Saudi Arabia. In this study, there was another dimension related to COVID-19, where the majority again highlighted the importance of BMW during the pandemic. This will be crucial if the pandemic lingers for long periods of time and will necessitate making adequate management of BMW a standard of protocol for all medical crises.

In term of the results about BMW, our results were similar to the previous studies conducted in India and Saudi Arabia [8,24] in terms of receiving professional training (30.2%), awareness of the document outlining a dental waste management policy (52.2%) and not to dispose of all waste types in the clinics general garbage (83%). This shows that practices are similar among the local studies, but at the same time, there is an unsatisfactory level of practice. One interesting point to highlight is that 67.6% of our participants responded that BMW uses a color-coding system, which is similar to the results in the previous Saudi study [24]. However, while BMW management in many counties do use color coding [8], in Saudi Arabia, the management of BMW does not use color coding but, rather, uses a labeling system with yellow bags for BMW, in accordance with the unified guidelines for BMW management in Arabian Gulf countries amended in 2019 [29], which is the official guidance for the handling of BMW in Saudi Arabia. This again highlights our point that BMW should be incorporated in the country's educational curriculum for dental students and dentists in accordance with the country's policies.

This might be the first study to validate a questionnaire about BMW during the COVID-19 pandemic. In fact, this questionnaire can be used in future studies to assess BMW knowledge, attitudes, and practice protocols. However, there are some limitations of this study, including a low sample size and the use of a self-reported questionnaire. Future studies should include larger sample sizes from dental faculties all across Saudi Arabia and dental clinics from both the private and governmental sectors.

Conclusion

The study generated a validated questionnaire for measuring BMW knowledge, attitudes and practice protocols in dental environments for dental professionals. Dental professionals in Saudi Arabia have low levels of knowledge about BMW management and they are encouraged to have more training on the topic, especially during this COVID-19 pandemic.

Bibliography

1. Fett M. "Technology, Health and Health Care". Occasional Papers: Health Financing Series 5 (2008).
2. Mathur V, *et al.* "Knowledge, attitude, and practices about biomedical waste management among healthcare personnel: A cross-sectional study". *Indian Journal of Community Medicine* 36.2 (2011): 143.
3. Chartier Y, *et al.*, "Safe Management of Wastes From Health-Care Activities". 2nd edition. Geneva: World Health Organization (2014).
4. Shalini S. "Awareness about bio-medical waste management among health care personnel of some important medical centers in Agra". *International Journal of Environmental Science and Development* 1.3 (2010): 251-255.

5. Basu RN. "Issues involved in hospital waste management-an experience from a large teaching institution". *Journal (Academy of Hospital Administration (India))* 7.2-1 (1995): 79-83.
6. Government of India, Ministry of Health and Family Welfare (MoHFW). "National Guidelines on Hospital Waste Management Based upon the Bio-Medical Waste (Management and Handling) Rules". 1998. New Delhi: Mo HFW (2002).
7. Townend WK. "Safe Management of Wastes From Health-Care Activities". Edited by Prüss A., *et al.* Geneva: World Health Organization (1999).
8. Sanjeev R., *et al.* "Knowledge, attitude, and practices about biomedical waste management among dental healthcare personnel in dental colleges in Kothamangalam: A cross-sectional study". *Health Science* 1.3 (2014): 1-2.
9. Kesavan R., *et al.* "Awareness and practices of dental care waste management among dental practitioners in Chennai city-A cross sectional questionnaire study". *Journal of Indian Association of Public Health Dentistry* 9.5 (2011): 289.
10. Sharma A., *et al.* "Awareness of biomedical waste management among health care personnel in Jaipur, India". *Oral Health Dental Management* 12.1 (2013): 32-40.
11. Turnberg WL and Frost F. "Survey of occupational exposure of waste industry workers to infectious waste in Washington State". *American Journal of Public Health* 80.10 (1990): 1262-1264.
12. Johannessen L., *et al.* "Healthcare waste management guidance note". World Bank, Health Population and Nutrition Team (2000).
13. Gupta NK., *et al.* "Knowledge, attitude and practices of biomedical waste management among health care personnel in selected primary health care centres in Lucknow". *International Journal of Community Medicine and Public Health* 3.1 (2016): 309-313.
14. Rao HV. "Disposal of hospital wastes in Bangalore and their impact on environment". In the Third International Conference on Appropriate Waste Management Technologies for Developing Countries Nagpur (1995): 25-26.
15. Yadavannavar MC., *et al.* "Biomedical waste management: A study of knowledge, attitude, and practices in a tertiary health care institution in Bijapur". *Indian Journal of Community Medicine* 35.1 (2010): 170.
16. Chopra R., *et al.* "Awareness and attitude regarding biomedical waste disposal among post-graduate students, under-graduate students and auxiliary staff of a dental college-a questionnaire survey". *Indian Journal of Dental Research* 5 (2017): 64-67.
17. Diaz-Soriano A., *et al.* "Knowledge and awareness of effective recycling of dental materials and waste management among Peruvian undergraduate students of dentistry: A logistic regression analysis". *Journal of International Society of Preventive and Community Dentistry* 10.3 (2020): 309.
18. Manchanda K., *et al.* "Knowledge, attitude, and practices about biomedical waste management among dental healthcare personnel in dental colleges in Himachal Pradesh: A cross-sectional study". *SRM Journal of Research in Dental Sciences* 6.3 (2015): 166.
19. Singh T., *et al.* "Awareness of biomedical waste management in dental students in different dental colleges in Nepal". *BioMed Research International* (2018): 1742326.
20. Pawar PA and Patil TS. "Knowledge, practice and attitude of dental care waste management among private dental practitioners in Latur city". *International Dental Journal of Students Research* 5 (2017): 80-84.
21. Aljunaid MA and Kusumo AD. "Knowledge and awareness of bio-medical waste, management among senior undergraduate and specialist dental students: Cross-sectional study". *Indian Journal of Forensic Medicine and Toxicology* 14.3 (2020): 2058-2062.
22. Lakshmi MN., *et al.* "Knowledge, attitude and practices about biomedical waste management among dental undergraduates and post graduates in GDC and H, Hyderabad" (2018).

23. Sudeep CB., *et al.* "KAP study to assess biomedical waste management in a dental college in south India". *World Journal of Pharmacists and Pharmaceutical Science* 6 (2017): 1788-1794.
24. Sabbahi DA., *et al.* "Management of dental waste in dental offices and clinics in Jeddah, Saudi Arabia". *Journal of the Air and Waste Management Association* 70.10 (2020): 1022-1029.
25. Huang C., *et al.* "Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China". *The Lancet* 395.10223 (2020): 497-506.
26. Jordan V. "Coronavirus (COVID-19): Infection control and prevention measures". *Journal of Primary Health Care* 12.1 (2020): 96-97.
27. World Health Organization. "Water, sanitation, hygiene, and waste management for SARS-CoV-2, the virus that causes COVID-19: Interim guidance". World Health Organization (2020).
28. "Coronavirus infectious waste management". *British Dental Journal* 228.802 (2020).
29. The unified guidelines for biomedical waste management in Arabian Gulf countries, Ministry of Health (MOH) (2020).

Volume 20 Issue 2 February 2021

©All rights reserved by Maryam Khader Alghamdi., *et al.*