

Family Medicine Residents' Knowledge of Botox and Dermal Fillers in The Joint Program for Postgraduate Studies in Family Medicine, Jeddah, 2018

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ABSTRACT

Introduction: In the current world, the aesthetic dermatology has become a critical branch in the health industry. Knowledge of Botox helps health professional to add to the existing ethical and policies that guide aesthetic practice. The knowledge is essential in assisting the dermatologists to incorporate the practice of medical dermatology, cosmetic dermatology as well as dermatosurgery. Besides, knowledge on Botox is vital towards general practitioners in that the current generation is seeking a refreshed and youthful outlook. The study is aimed to evaluate the knowledge of family medicine residents in the joint program for postgraduate studies of family medicine in Jeddah toward Botox and dermal fillers subject, aiming to improve the quality of family physicians services provided to the patients.

Materials and Methods: This cross-sectional study was conducted among family medicine residents in the joint program, Jeddah. All residents in all training years, regardless of sponsorships, nationality were invited to participate in the study. In order to measure the level of family medicine residents' knowledge, the knowledge about the Botox and dermal fillers was divided into different domains; each domain includes some items, and each item scored either one for the correct answer and 0 for the incorrect answer. Scores of all items were added to come up with a score that measures the general knowledge for each resident.

Results: Although residents had a high rate of correct responses for some approved therapeutic uses of Botox such as overactive bladder (82.3%), blepharospasm and strabismus (53.8%), and chronic migraine (59.2), a low rate of incorrect

responses was also documented for other conditions where Botox was or was not approved for use. Nevertheless, most of our respondents appeared to be more informed that Botox was not indicated for use in pregnant and breastfeeding women, with questions receiving > 50% correct responses. Of note, our residents appeared to be knowledgeable about the usage precautions of Botox, with 77.7% correctly responding to the questions assessing their knowledge on this topic, but most questions on the treatment-related side effects of Botox received < 50% of correct answers.

Conclusion: Family medicine residents should also be encouraged to seek more knowledge by attending workshops and lectures on cosmetic dermatology. Finally, there may be a need to review the family medicine curriculum with regard to the teaching of core dermatology subjects that may benefit family medicine residents and, by proxy, their patients.

Keywords: Botox; Cosmetics; Dermal Fillers.

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INTRODUCTION

Botox is referred to as a neurotoxic protein manufactured by bacteria called *Clostridium botulinum* and other associated species. The bacterium prevents the discharge of the neurotransmitter acetylcholine causing flaccid paralysis. Medical professionals maintain that contagion with the bacterium results in botulism disease. The toxin is extensively utilized commercially in medicine, research, and cosmetics.¹ The initial examination of botulinum toxin was in monkeys where experts discovered that it condensed wrinkles in the glabella.²

Botox can be employed to treat several conditions ranging from severe pain conditions to less severe problems.³ In general, "Botox can be used to treat chronic migraines, neuralgia pain from any neuralgia-type disorder, spasticity, excessive sweating, and overactive bladder as well as teeth grinding and eye twitching".⁴ There are significant differences between Botox and dermal fillers.⁵ Botox is known to freeze the muscle to stop wrinkles resulting from facial expression while dermal fillers employ hyaluronic acid and other substances to fill in the regions that

have lost smoothness and volume.⁴ Another difference is that dermal fillers results differ based on which filler is employed while Botox results proceed for 3 to 4 months. In general, the two methods are different and treat work differently; they can be integrated into a single treatment.⁴

In the current world, the aesthetic dermatology has become a critical branch in the health industry. Knowledge of Botox helps health professional to add to the existing ethical and policies that guide aesthetic practice.⁶ The knowledge is essential in assisting the dermatologists to incorporate the practice of medical dermatology, cosmetic dermatology as well as dermatosurgery.⁷ The ethical practice has been the basic standard in the health industry particularly on dermatology department preventing unnecessary procedures. Besides, knowledge on Botox is vital towards general practitioners in that the current generation is seeking a refreshed and youthful outlook.⁸

Thus, education on the mechanism of actions, approval dates, uses, precautions, contraindications and side effects as well as the differences between Botox and dermal fillers has become the starting point.⁶ In general terms, it is important for practitioners to be equipped with this knowledge so that they can advise their patients on the effectiveness and drawbacks of the processes.

The study is aimed to evaluate the knowledge of family medicine residents in the joint program for postgraduate studies of family medicine in Jeddah toward Botox and dermal fillers subject, aiming to improve the quality of family physicians services provided to the patients.

MATERIALS AND METHODS

This cross-sectional study was conducted among family medicine residents in the joint program, Jeddah. All residents in all training years, regardless of sponsorships, nationality were invited to participate in the study. The sample size was calculated using Raosoft calculator. With an acceptable margin of error of 5% and estimated prevalence of 50%; this will give maxim sample size; with a confidence interval of 0.05 at a confidence level of 95% and the total number of family medicine residents in the joint program of family medicine in Jeddah city was 138. The calculated sample size was 102 subjects. The researcher increased the sample size

to 130 residents. The researcher designed a self-administered questionnaire. The questionnaire was divided into subsections. The first subsection covers the socio-demographic data. The rest of the subsections divided into domains and each domain has some questions about a different aspect of the knowledge about Botox and dermal fillers and the sources of information. Three practicing consultants validated the questionnaire, two of them were dermatologists specialized in cosmetic dermatology, and the third one was consultant of family medicine. The study protocol was approved by the joint program of family and community medicine. The questionnaire was anonymous to assured confidentiality of data.

In order to measure the level of family medicine residents' knowledge, the knowledge about the Botox and dermal fillers was divided into different domains; each domain includes some items, and each item scored either one for the correct answer and 0 for the incorrect answer. Scores of all items were added to come up with a score that measures the general knowledge for each resident.

The following variables, age, gender, nationality, level of training, years of experience, residency, sponsorship, and sources of knowledge about Botox and dermal fillers, were used as predictors of the level of general knowledge of family medicine residents. The questionnaire was piloted by testing 10% of the calculated sample size to validate the questionnaire by assessing clarity and estimating the time needed to complete the questionnaires. The researcher contacted all residents. After took their e-mails and phone numbers from the secretary of the Family medicine joint program, the researcher described the aim and objectives of the study for the residents and asked them to be involved in the study by responding to the distributed self-administered questionnaire. The filled questionnaires were received by e-mails and who were not respond by e-mail the researcher contacted them via phone call and text messages, 130 of the residents responded to the researcher and fulfilled the questionnaire. The data was entered and analyzed by SPSS, version 21. We used the mean or the median and standard deviation or the range to describe continuous variables and percentage to summarize nominal and ordinal data.

Table 1: Residents' general knowledge of Botox and dermal fillers

Item (correct answer)	Respondents who gave correct answers	
	n	%
Botox is a toxin of (Bacteria)	110	84.6
Botox is a neurotoxin derived from(<i>Clostridium botulinum</i>)	109	83.8
How does Botox work? (Paralyzing the muscles)	83	63.8
Botox acts on the nerve by (Blocking the release of acetylcholine)	77	59.2
What is the most potent and commercially available type of botulinum toxin for clinical use? (Type A)	71	54.6
When was Botox approved by the FDA for cosmetic purposes? (2002)	44	33.8
What is the first Botox indication approved by FDA? (Eye muscles problem)	37	28.5
What is the best age to start using Botox? (no specific age)	66	50.8
How long before the patient can see the result of Botox treatment? (3–5 Days)	65	50
How long does a Botox treatment last? (3–4 months)	54	41.5
How many types of dermal fillers are used now? (5 Types)	27	20.8

RESULTS

General Knowledge of Residents Regarding Botox and Dermal Fillers (Table 1)

Most of the physicians (84.6%) were aware that Botox was a bacterial toxin, and a slightly smaller proportion (83.8%) knew it was a neurotoxin derived from *Clostridium botulinum*. In addition, only 59.2% were aware that Botox acted on the nerve by blocking the release of acetylcholine. Additionally, about 54.6% of the respondents knew that the most potent and commercially available type of botulinum toxin for clinical use was type A. Furthermore, less than half of the residents (33.8%) were aware that Botox was approved for cosmetics in 2002, whereas only 28.5% were aware that eye muscle problem was the first Botox indication approved by the Food and Drug Administration (FDA). Approximately 50.8% of the surveyed physicians correctly responded that there was no specific age to start using Botox. A similar proportion of residents (50%) were aware that it took 3–5 days for the patient to see the results of Botox treatment, whereas 41.5% responded that Botox treatments took 3–4 months to take full effect. Lastly, less than one-fourth (20.8%) were aware that five types of dermal fillers were currently available for use.

Residents' Knowledge of Botox® Uses and Its Side Effects

Of the 130 surveyed residents, 107 (82.3%) knew that Botox was approved for therapeutic use in overactive bladder, followed by 70 (53.8%) who knew about its approval in blepharospasm and strabismus, and 77 (59.2) who knew about its approval in chronic migraine. A similar proportion of residents knew about its use in varicose veins and hyperhidrosis. The distribution of the respondents' responses regarding other uses of Botox are detailed in table 2.

Regarding the treatment-related side effects of Botox, 96 residents (73.8%) were aware that Botox treatments had side effects. The proportion of correct responses to the questions varied considerably, with most questions receiving < 50% of correct answers. The most well-answered question was on whether Botox treatment caused general botulism, which was correctly answered by 68 residents (52.3%). Conversely, correct response rates were lower for questions that assessed residents' knowledge of whether Botox therapy could cause headaches (22.3%), stroke (42.3%), flu-like symptoms (13.1%), blood pressure (43.8%), dysphagia if injected in the neck (20.0%), wrinkles when used at an early age (47.7%).

Table 2: Residents' knowledge of Botox uses and its side effects

Item (Correct answer)	Respondents who gave correct answers	
	No.	%
BOTOX® IS CURRENTLY APPROVED FOR THERAPEUTIC USE IN THE FOLLOWING		
Overactive bladder (Agree)	107	82.3
Blepharospasm and strabismus (Agree)	70	53.8
Chronic migraine (Agree)	77	59.2
Varicose veins (Disagree)	79	60.8
Hyperhidrosis (Agree)	79	60.8
Soothing of facial wrinkles (Agree)	118	90.8
Facial spasm (Disagree)	36	27.7
Peptic ulcer (Disagree)	100	83.8
Achalasia (Agree)	44	33.8
Anal fissure (Agree)	62	47.7
Spasticity (Agree)	63	48.5
Cervical dystonia (Agree)	56	43.1
Diabetic neuropathy (Disagree)	102	78.5
BOTOX SIDE EFFECTS		
Does Botox® treatment have side effects? (YES)	96	73.8
Does Botox® treatment cause general botulism? (NO)	68	52.3
Does Botox® treatment cause headaches? (YES)	29	22.3
Does Botox® treatment cause stroke? (NO)	55	42.3
Does Botox® treatment cause flu-like symptoms? (YES)	17	13.1
Does Botox® treatment cause high blood pressure? (NO)	57	43.8
Does Botox® treatment cause dysphagia if injected in the neck? (YES)	26	20.0
Does Botox® treatment cause heart failure? (NO)	59	45.4
Does Botox® treatment cause heart failure? (NO)	59	45.4

Table 3: Residents' knowledge of dermal filler uses and side effects

Item (Correct answer)	Respondents who gave correct answers	
	n	%
DERMAL FILLER USES		
Dermal fillers are approved by the FDA to be used for the correction of moderate to severe wrinkles (YES)	66	50.8
Dermal fillers are approved by the FDA to be used for breast augmentation (NO)	33	25.4
Dermal fillers are approved by the FDA to be used for hand augmentation (YES)	54	41.5
Dermal fillers are approved by the FDA to be used to increase fullness of the feet (NO)	16	12.3
Dermal fillers are approved by the FDA to be used for lip and cheek augmentation (YES)	86	66.2
Dermal fillers are approved by the FDA to be used to increase the size of the buttocks (NO)	27	20.8
DERMAL FILLER SIDE EFFECTS		
Dermal fillers can cause blindness in rare cases(YES)	65	50.0
Dermal fillers can cause lumps (YES)	104	80.0
Dermal fillers can cause blockage of blood flow in the injected area (YES)	99	76.2
Dermal fillers can cause asymmetrical appearance in the injected area (YES)	113	86.9
Dermal fillers can cause hearing loss (NO)	97	74.6
Dermal filler can cause skin necrosis (YES)	91	70.0
Dermal filler can cause cancer (NO)	105	80.8
Dermal filler can cause acne-like skin eruptions (YES)	65	50.0

Abbreviation: FDA, Food and Drug Administration

Residents' Knowledge of the Use of Dermal Fillers and Treatment- Associated Side Effects

Most questions on the uses of dermal fillers received < 50% of correct responses (table 3). The most well-answered question was on the FDA's approved use of dermal fillers for lip and cheek augmentation, which received 66.2% of correct responses. The worst performance was on the question that assessed residents' knowledge of the FDA's approved use of dermal fillers to increase fullness of the feet, which received only 12.3% of correct responses.

Residents' performance on the side effects of side fillers was much improved, with all questions receiving > 50% of correct responses (table 3).

Most respondents were aware that dermal fillers could cause an asymmetrical appearance in the injected area (86.9%), lumps (80.0), blockage of blood flow in the injected area (76.2%), skin necrosis (70.0%), and blindness in rare cases (50.0%). Residents

were also aware that cancer (80.8%) and hearing loss (74.6%) were not treatment-associated side effects of dermal fillers.

Residents' Knowledge of the Contraindications and Usage Precautions of Botox and Dermal Fillers

A large proportion of residents were knowledgeable about the use of Botox in specific populations (table 4). Of the 130 surveyed residents, 83.1% knew whether it could be used during pregnancy, 72.3% were aware about its use in breastfeeding women, and 76.9% of the residents knew about its use during pregnancy and breastfeeding. However, less than one- fifth of the residents (14.6%) responded correctly to the question on the administration of Botox injections in patients with degenerative neuromuscular disease, and only 16.2% were aware that patients with a history of albumin could react to Botox.

On the other hand, residents appeared to be knowledgeable about the usage precautions of Botox, with 77.7% correctly responding to the questions assessing their knowledge on this topic (table 4).

Table 4: Knowledge of residents regarding contraindication and precautions of Botox and dermal fillers

Item (Correct answer)	Respondents with correct answers	
	n	%
BOTOX AND DERMAL FILLERS CONTRAINDICATION		
Can Botox [®] be used during pregnancy? (NO)	108	83.1
Can Botox [®] be used during breastfeeding? (NO)	94	72.3
Can dermal fillers be used during pregnancy and breastfeeding? (YES)	100	76.9
Can a patient with a history of albumin reaction use Botox [®] ? (NO)	21	16.2
Does the patient's allergy status to lidocaine be checked before dermal filler injection? (YES)	49	37.7
Can the patient with degenerative neuromuscular diseases be treated with Botox [®] injections? (NO)	19	14.6
PRECAUTIONS AFTER BOTOX[®] TREATMENT		
The patient can massage the area immediately after Botox [®] treatment (False)	101	77.7
The patient can do vigorous exercise immediately after Botox [®] treatment (False)	101	77.7

Table 5: Association between gender and residents' knowledge of Botox and dermal fillers*

Variables	Male (n = 36)	Female (n = 94)	p-value
Overall score	51.0 ± 9.5	55.2 ± 12.8	0.036
Knowledge of Botox	0.5 ± 0.2	0.6 ± 0.2	0.826
Knowledge of Botox side effects	0.3 ± 0.2	0.4 ± 0.2	0.687
Knowledge of Botox uses	0.5 ± 0.1	0.6 ± 0.2	0.271
Knowledge of Botox and dermal filler contraindications	0.6 ± 0.2	0.6 ± 0.2	0.277
Knowledge of Botox and dermal filler usage precautions	0.8 ± 0.3	0.8 ± 0.4	0.009
Knowledge of the differences between Botox and dermal fillers	0.4 ± 0.4	0.6 ± 0.4	0.428
Knowledge of the side effects of dermal fillers and allergy status	0.6 ± 0.2	0.6 ± 0.2	0.842
Knowledge of the uses of dermal fillers	0.3 ± 0.2	0.4 ± 0.2	0.869
Knowledge of dermal fillers	0.4 ± 0.3	0.5 ± 0.3	0.203

Association between Gender and Residents' Knowledge of Botox and Dermal Fillers

Further analysis showed that female residents appeared to perform better on questions that assessed their knowledge of Botox (0.6 ± 0.2 for females vs 0.5 ± 0.2 for males), Botox side effects (0.4 ± 0.2 for females vs 0.3 ± 0.2 for males), Botox uses (0.6 ± 0.2 for females vs 0.5 ± 0.1 for males), differences between Botox and dermal fillers (0.6 ± 0.4 for females vs 0.4 ± 0.4 for males), uses of dermal fillers (0.3 ± 0.2 for females vs 0.4 ± 0.2 for males) and dermal fillers (0.5 ± 0.3 for females vs 0.4 ± 0.3 for males); however, the differences in mean knowledge scores did not reach statistical significance [table 5]. However, both genders had equal mean scores on questions that assessed their knowledge of Botox and dermal filler usage precautions (p = 0.009) [table 5]. Conversely, mean scores did not differ significantly between males and females on questions that assessed their knowledge of Botox and dermal filler contraindications (p = 0.277) as well as their knowledge of the side effects of dermal fillers (p = 0.842).

Association between Years of Experience Prior to Residency and Residents' Knowledge of Botox and Dermal Fillers

The mean score among residents who had no clinical experience prior to residency was 54.1 ± 12.5 versus 54.0 ± 11.8 for residents who had clinical experience before their graduate training. However, an independent- samples test did not show statistically significant differences in the residents' mean scores (p = 0.524).

Residents' Sources of Knowledge on Botox and Dermal Fillers (Figure 1)

The residents' sources of information on Botox and dermal fillers, with most common sources being the media (n = 68, 52.3%). Other less common sources included a combination of lectures and the media (n = 13, 10.0%), medical journals and the media (n = 13, 10.0%), and courses, lectures and the media (n = 7, 5.4%). More than two-thirds (n = 94, 72.3%) of the residents identified that people asked them about Botox and dermal fillers outside the clinic, whereas approximately 18.5% (n=24) identified that patients in the clinic asked about Botox & dermal fillers at the clinic.

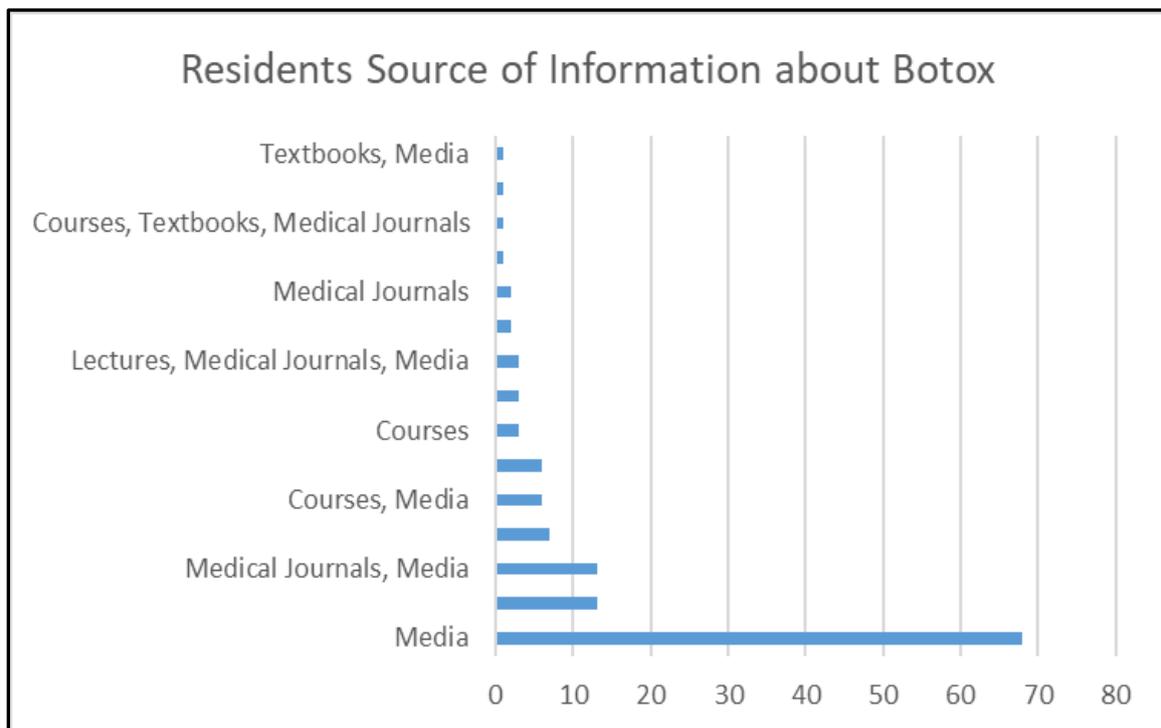


Figure 1: Residents' sources of information on Botox and dermal fillers.

DISCUSSION

This study is novel in that it incorporates a range of key areas regarding the use of Botox and dermal fillers and assesses family medicine residents' knowledge of these cosmetic treatments. It focuses not only on the residents' basic knowledge of Botox and dermal fillers, but also on their understanding of the side effects, precautions, and contraindications of these dermal treatments.

Botulinum toxin applies its influence by slicing critical proteins needed for the nerve activation. "The toxin connects particularly to nerves which utilize the neurotransmitter acetylcholine". In this stage, the neuron transmits the toxin into a vesicle. The vesicle acidifies stimulating a section of the toxin which activates it to thrust across the vesicle membrane and into the cytoplasm. In the cytoplasm, the toxin slices capture proteins averting the cell from discharging vesicles of neurotransmitter.⁴ The nerve signaling is stopped causing paralysis. The toxin is discharged from the bacterium as one chain then stimulated when sliced by its proteases.⁹

After the licensing and branding of botulinum toxin, it was approved by the Food and Drug Administration (FDA) for several cosmetics and medical uses.⁹ In 1989, the FDA approved blepharospasm and strabismus. In the year 2000, cervical dystonia received the approval. The glabella lines received their approval from FDA in the year 2002. In 2004, the treatment of excessive sweating (axillary hyperhidrosis) was approved.¹⁰ Tassorelli, indicates that the upper lip spasticity and chronic migraines are approved in 2010.² In 2011, the treatment of urinary incontinence was received approval, and finally, the lateral canthal lines (crow's feet) treatment was approved.⁹

Our analyses show that family medicine residents do not have adequate knowledge regarding Botox and dermal fillers. This is evidenced by the low rate of correct responses to questions on residents' awareness of the approval of Botox cosmetics in 2002 (33.8%) and knowledge of the fact that Botox was first approved by the FDA for use in eye muscle problems (28.5%). Although a high rate of correct responses was observed for some approved therapeutic uses of Botox such as overactive bladder (82.3%), blepharospasm and strabismus (53.8%), and chronic migraine (59.2), a low rate of incorrect responses was documented for other conditions where Botox was or was not approved for use. Additionally, only a modest proportion of residents responded correctly to questions on the requirement of a specific age to start using Botox (50.8%), the time for Botox to take full effect (50%), and the five types of dermal fillers currently available for use (20.8%). This is likely a reflection of a lack of cosmetic dermatology training in the curriculum of the Joint Program for Postgraduate Studies in Family Medicine, Jeddah, and the unavailability of patients willing to undergo cosmetic procedures by inexperienced residents. Nevertheless, most of our respondents appeared to be more informed that it was not indicated for use in pregnant and breastfeeding women, with questions receiving > 50% correct responses.

Among nonsurgical procedures, photorejuvenation saw the most significant increase in rates in 2016 (up to 36%), whereas botulinum toxin saw an increase of only 8%; the rate of injectables, including Botox and other related products, saw an increase of 10% in 2016.¹¹ In Saudi Arabia, only a single report describes the trends and characteristics of cosmetic surgery patients in three centers in Riyadh;¹² however, there are no data

showing the demand for nonsurgical cosmetic procedures in the kingdom, which may indirectly prompt residency training programs to modify their curricula in order to meet the needs of patients. It would be inconceivable if esthetic treatments such as dermal fillers are becoming popular in our context, yet physicians lack basic knowledge of the uses of these treatments. Although 66.2% of the residents in this survey were aware of the FDA's approved use of dermal fillers for lip and cheek augmentation, it was preposterous that only 12.3% of the respondents knew that the FDA did not approved them to increase fullness of the feet and 20.8% did not know that dermal fillers are not approved by FDA to increase buttocks size. We found that both genders had equal mean scores on questions that assessed their knowledge of Botox and dermal filler usage precautions ($p = 0.009$). This is an improvement, considering that female residents are generally thought to perform less than their male peers, probably because more female than male residents perceive gender bias in the academic setting.^{13,14}

During the past 20 years, the media has heavily glamorized anti-ageing treatments such as Botox injections and dermal fillers. From television to magazines and social media platforms, the media is constantly pushing people to expect perfection, and much of society—including conservative ones such as Saudi Arabia¹² attempts to achieve it. It is therefore conceivable that our residents cited the media, either alone or in combination with another source, as their most common source of information. On the other hand, it is disappointing that our residents mostly rely on sources other than courses, lectures and/or medical journals, which may be more reliable and evidenced-based.^{15,16}

This study should be interpreted in light of its limitations. One major limitation of this study was the short study period, which did not allow us to survey as many residents as possible. Also, the cross-sectional design of our study does not permit us to make any inferences about possible underlying causes of knowledge deficits in any group of residents. Further research is, therefore, warranted to identify potential causes of knowledge deficits and how these can be addressed. Because our data relied on the residents' ability to accurately recall information, we cannot overlook a possible source of bias in the data collection and analysis.

CONCLUSION

Although residents had a high rate of correct responses for some approved therapeutic uses of Botox such as overactive bladder, blepharospasm and strabismus, and chronic migraine, a low rate of incorrect responses was also documented for other conditions where Botox was or was not approved for use. Nevertheless, most of our respondents appeared to be more informed that Botox was not indicated for use in pregnant and breastfeeding women, with questions receiving > 50% correct responses. Of note, our residents appeared to be knowledgeable about the usage precautions of Botox, with 77.7% correctly responding to the questions assessing their knowledge on this topic, but most questions on the treatment-related side effects of Botox received < 50% of correct answers.

Future studies should include a larger sample of family medicine residents to identify and address gaps in knowledge regarding Botox and dermal fillers for therapeutic treatment. It may also help to know whether there is a high patient demand toward

nonsurgical cosmetic procedures among patients in our context and whether it may help to broaden the knowledge of future family medicine specialists. Family medicine residents should also be encouraged to seek more knowledge by attending workshops and lectures on cosmetic dermatology. Finally, there may be a need to review the family medicine curriculum with regard to the teaching of core dermatology subjects that may benefit family medicine residents and, by proxy, their patients.

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