

Knowledge, attitudes, and clinical practices of Turkish medical and dental practitioners regarding botulinum toxin use: A cross-sectional survey

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Abstract

Aim: This study aimed to evaluate the knowledge, attitudes, clinical practices, preferred indications, and adverse effects associated with botulinum toxin (BTX) use among medical and dental practitioners in Türkiye.

Methodology: An online, self-administered questionnaire adapted from previously published studies was conducted between October 9 and December 9, 2023. A total of 276 physicians and dentists across Türkiye voluntarily participated. Participants were recruited using convenience sampling via online distribution. The survey consisted of 16 questions assessing demographic characteristics, BTX experience, indications for use, number of patients treated annually, preferred commercial formulations, adverse effects, and bruxism management preferences. Statistical analyses were performed using descriptive statistics, chi-square test, and the Fisher-Freeman-Halton exact test, with significance determined at $p < 0.05$.

Results: A total of 53.3% of practitioners reported using BTX in clinical practice. The most common indications were bruxism (75.5%), facial wrinkles (67.3%), masseter hypertrophy (51.7%), and gummy smile (49%). OnabotulinumtoxinA was the most preferred formulation (73.5%). The most frequently reported treatment-related adverse effects were insufficient therapeutic response (49%) and localized stinging or burning pain during injection (22.4%). The injection-related adverse effects included pain (57.1%), bruising (49%), and headache (24.5%). Significant differences were observed across specialties and experience levels. BTX use was also significantly higher among practitioners working in private settings.

Conclusion: The findings show that BTX was used by a considerable proportion of medical and dental practitioners in the study sample across both aesthetic and therapeutic indications. Differences observed according to workplace setting, certification status, specialty, and experience suggest that BTX-related practice patterns may not be uniform. These results highlight the potential need for structured education, certification, and standardization regarding BTX use in clinical practice.

Keywords: Botulinum toxin, bruxism, temporomandibular disorders, medical practitioners, dental practitioners, onabotulinumtoxinA, incobotulinumtoxinA, abobotulinumtoxinA

Introduction

Botulinum toxin (BTX) is a neurotoxin produced by the gram-positive bacterium *Clostridium botulinum*. Seven strains of BTXs (A, B, C, D, E, F, and G) have been identified in the literature, among which neurotoxins A and B are commercially available for medical use (1).

The clinical use of BTX began in 1979 with Scott's injection into the extraocular muscles for the treatment of strabismus (2). Since then, its clinical applications have expanded to include gastrointestinal, neurological, ophthalmic, orthopedic, urological, dental, dermatological, painful, secretory, and numerous other medical conditions (3). BTX is used for both cosmetic and therapeutic purposes, including the reduction of facial wrinkles and management of conditions such as chronic migraine, hyperhidrosis, tics, and tremors (4). It can also conservatively treat dental-related problems, such as trigeminal neuralgia, bruxism, teeth grinding, temporomandibular disorders (TMDs), mandibular spasm, and sialorrhea (4, 5). BTX may also be used to retrain hyperactive muscles in patients with new prostheses, particularly in cases with decreased vertical dimension due to long-term tooth loss (5, 6). In addition, it has been applied as a minimally invasive approach in the management of aesthetic dental conditions, such as excessive gingival display (7, 8).

One of the therapeutic uses of BTX is in the treatment of TMDs. The temporomandibular joint (TMJ) may be affected by extrinsic or intrinsic factors that can cause pain, referred to as TMDs (9, 10). The etiology of TMD is considered multifactorial and remains not fully understood (11). A review by List and Jensen (12) revealed that the etiology of TMD is complex and is associated with multiple risk factors. These findings suggest that masticatory muscles may play an important role in TMD. Therefore, the ability of BTX to induce temporary relaxation may contribute to the reduction of bruxism and TMD symptoms (13, 14).

Bruxism, a common accompanying disorder, is frequently observed in individuals with TMD and facial pain. Bruxism is a para-functional habit involving teeth grinding or clenching that can occur while awake or asleep (15). Recent studies have shown that the therapeutic use of BTX can reduce orofacial pain, bite force, and muscle activity, as well as increase maximum mouth opening, and decrease muscle strength, including chewing muscles, in patients with TMD and bruxism (16, 17).

A review of the current literature indicates that BTX may be an effective treatment method for reducing functional impairment and relieving pain associated with TMD and bruxism. However, there is limited evidence in the literature concerning the training and confidence of practitioners and students regarding the use of BTX in the management of TMD. Similarly, research on BTX awareness of TMD and bruxism among patients is limited. Studies on the effects of demographic variables on BTX awareness are even rarer. These findings highlight the

need to investigate the awareness of BTX as a treatment option within the dental community (11).

The use of BTX in dental practice appears to be increasing, and it is accepted in many countries around the world. For instance, dentists in the US states of Massachusetts and New Jersey are required to complete accredited training courses to administer BTX (18). The British Association of Cosmetic Dental Professionals permits dentists to prescribe and administer BTX for muscle-related disorders or to support other dental treatments, such as implant osseointegration; however, misleading advertisements are prohibited (18). The Irish Dental Council permits dentists to use BTX for oral conditions, such as TMJ deformity or chronic pain (18). Similarly, the Australian Dental Council allows the use of BTX (18). In Asia, the Singapore Dental Board has authorized certified and trained dentists to administer BTX for cosmetic purposes, expanding the scope of practice of maxillofacial surgeons to include the treatment of the head and neck regions (18).

BTX is an optional treatment that can be combined with conventional dental treatment, and its use is likely to increase in the future. However, studies investigating dentists' knowledge, experience, practices, and training regarding the non-cosmetic use of BTX injections in clinical practice are still limited. BTX is also widely used by physicians across various medical specialties; therefore, understanding their knowledge and practice patterns is essential. This study aimed to evaluate the clinical experience, practice patterns, preferred indications, and adverse effects associated with BTX use among Turkish medical and dental practitioners, with particular emphasis on differences related to specialty, workplace setting, certification status, and professional experience.

The null hypothesis was that there would be no significant differences in BTX use, treatment preferences, or reported adverse effects according to these practitioner-related factors.

Materials and Methods

The study was conducted in accordance with the principles of the Declaration of Helsinki and approved by the Istanbul Yeni Yüzyıl University Non-Interventional Research Ethics Committee (approval number: 2023/10-1101).

This study was conducted using an online, self-administered questionnaire between October 9, 2023, and December 9, 2023, to evaluate the attitudes of Turkish medical and dental practitioners toward the use of BTX. The questionnaire was created using Google Forms, and the link was shared through various social media platforms to reach medical and dental practitioners across Türkiye. A non-probability convenience sampling approach was employed. Due to the open distribution strategy, a predefined target population could not be established, and the response rate could not be calculated.

The questionnaire was adapted from previously published studies (18-20) evaluating knowledge and attitudes toward BTX, to ensure content validity and methodological consistency with the literature. The questionnaire items are listed in Table 1. As the survey was administered, the items were reviewed for linguistic clarity and content appropriateness by the research team prior to its distribution. A pilot evaluation was conducted with a small group of practitioners to ensure the clarity and comprehensibility of the questions. However, formal validity and reliability analyses, such as construct validity testing or internal consistency measures (e.g., Cronbach's alpha), have not been performed.

Participation was voluntary, and electronic informed consent was obtained from all participants before the initiation of the questionnaire. A total of 276 practitioners (medical and dental) voluntarily participated in the study. No formal sample size calculation was performed because of the exploratory nature of the study and the open recruitment strategy. The inclusion criteria were as follows: (1) being a licensed dentist or physician in Türkiye, (2) currently practicing in a clinical setting, and (3) agreeing to participate in the survey. There were no restrictions based on specialty, years of experience, or workplace setting. Participants who did not complete the

questionnaire or were not actively practicing at the time of the survey were excluded.

The questionnaire consisted of 16 questions. Five questions collected demographic information, including age, sex, specialty, workplace setting, and geographic region. The remaining questions assessed the participants' clinical experience with BTX, including years of practice, indications for use, annual number of treated patients, preferred commercial formulations, adverse effects, and BTX certification. The Google Forms survey automatically recorded the responses in a secure online database accessible only to the research team.

Primary comparisons were predefined based on practitioner-related variables, including specialty, workplace setting, BTX certification status, and years of professional experience.

Statistical analysis

The statistical analysis was performed using the IBM SPSS Statistics for Windows software (version 22.0; IBM Corp., Armonk, NY, USA).

Descriptive statistics were used to evaluate the study data. The chi-square and Fisher-Freeman-Halton exact tests were used to compare categorical variables. Statistical significance was set at $p < 0.05$.

Table 1. Questionnaire questions.

Evaluation of physicians' knowledge and attitudes regarding botulinum toxin	
1. How old are you?	
a.	23-30
b.	31-40
c.	41-50
d.	51-60
e.	61-70
2. What is your gender?	
a.	Female
b.	Male
3. Please indicate your profession/specialty:	
a.	General dentist
b.	Prosthodontist
c.	Oral and maxillofacial surgeon
d.	Periodontist
e.	Endodontist
f.	Oral and maxillofacial radiologist
g.	Orthodontist
h.	Restorative dentistry specialist
i.	Pedodontist (Pediatric dentist)
j.	General practitioner (Medical doctor)
k.	Medical specialist

4. Please indicate the institution where you work:

- a. State hospital
- b. Private hospital
- c. University hospital
- d. Private practice / Clinic

5. In which region is the institution where you work located?

- a. Urban (Center)
- b. Rural

6. Do you use Botox in clinical applications?

- a. Yes
- b. No

7. If your answer is no, please provide the reasons:

- a. High cost
- b. Fear
- c. Considering it unnecessary
- d. Possibility of side effects
- e. Religious reasons
- f. Concern that facial expressions may change

8. If your answer is yes, how long have you been performing Botox applications? (Experience)

- a. More than 10 years
- b. Between 5-10 years
- c. Up to 5 years
- d. 2 years or less

9. For which indications do you perform Botox?

- a. Unwanted wrinkles
- b. Strabismus
- c. Cervical dystonia - cervical muscle spasm
- d. Migraine
- e. Blepharospasm - involuntary contraction of the eyelids
- f. Urinary incontinence
- g. Hemifacial spasm
- h. Excessive sweating (Hyperhidrosis)
- i. Children with cerebral palsy
- j. Bruxism
- k. Trigeminal neuralgia
- l. Masseter hypertrophy
- m. Myofascial pain
- n. Trismus
- o. Gummy smile - high smile line

10. On average, how many patients do you treat with Botox per year?

- a. 0-20
- b. 20-49
- c. 50-100
- d. Over 100

11. Which Botox product do you use?

- a. OnabotulinumtoxinA - Allergan
- b. IncobotulinumtoxinA - Xeomin
- c. AbobotulinumtoxinA - Dysport
- d. Other

12. Which of the following side effects of Botox have you encountered?
a. Lack of intended effect in the treatment area b. Allergic reactions c. Weakness in muscles adjacent to the treatment area d. Localized stinging or burning pain during injection e. Dry eyes / Excessive tearing f. Incomplete eyelid closure g. Brow ptosis h. Drooping eyelid (Ptosis) i. Facial asymmetry j. None
13. Which of the following injection-related side effects have you encountered during botulinum toxin applications?
a. Pain b. Bruising c. Erythema (Redness) d. Edema (Swelling) e. Tenderness f. Headache g. Infection h. Numbness or dysesthesia i. Vasovagal attack and loss of consciousness j. None
14. Do you have a Botox application certificate?
a. Yes b. No
15. Which type of treatment would you recommend for a patient with bruxism?
a. Splint b. Botox c. Botox and splint
16. Which muscles do you treat with Botox in a patient with bruxism?
a. Masseter b. Temporal c. Pterygoid

Results

A total of 276 medical and dental practitioners participated in this study. The age distribution of the participants was as follows: 23-30 years (23.9%), 31-40 years (44.6%), 41-50 years (22.8%), 51-60 years (7.6%), and 61-70 years (1.1%). Overall, 56.5% were female, and 43.5% were male (Table 2).

Regarding professional background, 46.7% were specialist physicians, followed by general dentists (15.2%), prosthodontists (10.9%), periodontists (5.4%), specialists in restorative dentistry (5.4%), general physicians (4.3%), oral and maxillofacial surgeons (3.3%), pediatric dentists (3.3%), oral radiologists (2.2%), orthodontists (2.2%), and endodontists (1.1%).

Participants were employed in university hospitals (37%), public hospitals (29.3%), private clinics (28.3%), and private hospitals (5.4%). Most participants (78.3%) practiced in urban areas, while 21.7% worked in rural regions (Table 2).

Use of BTX in clinical practice

Among the practitioners, 53.3% reported performing BTX injections, whereas 46.7% did not. Reasons for not using BTX included perceiving it as unnecessary (39.5%), high cost (16.3%), risk of adverse effects (11.6%), concern about changes in facial expression (9.3%), religious reasons (4.7%), and fear (7%). Among BTX users, 40.8% had ≤2 years of experience, 20.4% had 2-5 years, 30.6%

had 5-10 years, and 8.2% had more than 10 years of experience (Table 3).

Indications for BTX administration

The most common indications for BTX use were bruxism (75.5%), facial wrinkles (67.3%), masseter hypertrophy (51.7%), and gummy smile (49%). Other indications included hyperhidrosis (28.6%), migraine (22.4%), myofascial pain (12.2%), trigeminal neuralgia (9.5%), trismus (8.2%), spasticity in children with cerebral palsy (6.1%), blepharospasm (5.4%), cervical dystonia (4.1%), hemifacial spasm (4.1%), strabismus (2%), and urinary incontinence (2%) (Table 3).

Annual BTX treatment volume and toxin types used

Among the practitioners, 53.1% treated 0-20 patients annually, 14.3% treated 20-49 patients, 16.3% treated 50-100 patients, and 16.3% treated more than 100 patients (Table 3). The most commonly used toxin formulation was onabotulinumtoxinA (73.5%), followed by abobotulinumtoxinA (65.3%), incobotulinumtoxinA (11.6%), and other brands (23.8%) (Table 4).

Reported adverse effects

Treatment-related adverse effects included lack of desired treatment effect (49%), localized stinging or burning pain during injection (22.4%), allergic reactions (18.4%), weakness in adjacent muscles (16.3%), eyebrow ptosis (14.3%), incomplete eyelid closure (10.2%), facial asymmetry (6.1%), dry eye/epiphora (2%), and eyelid drooping (2%). A total of 24.5% of the patients reported no treatment-related adverse effects (Table 4).

The injection-related adverse effects included pain (57.1%), bruising (49%), headache (24.5%), tenderness (20.4%), erythema (14.3%), edema (12.2%), infection (4.1%), numbness/dysesthesia (2%), and vasovagal syncope (2%). Additionally, 16.3% of participants reported no injection-related adverse effects (Table 4).

Bruxism management

A total of 201 participants responded to the bruxism-related questions, regardless of their BTX usage status. A combination of BTX and splint therapy was recommended by 56.7% of respondents, while 26.9% recommended BTX alone, and 16.4% recommended splint therapy alone. BTX was most frequently injected into the masseter muscle (97%), followed by the temporalis (61.2%) and pterygoid (13.4 %) muscles (Table 4).

Comparisons between groups

There was no significant difference in BTX usage rates among the specialties ($p > 0.05$) (Table 5) (Fig. 1). Practitioners employed in private hospitals (100%) and private clinics (80.8%) had significantly higher BTX usage rates than those working in public hospitals (44.4%) and university hospitals (32.4%) ($p = 0.001$) (Table 5) (Fig. 2).

Additionally, practitioners with BTX certification had significantly higher usage rates (85.7%) than those without certification (26%) ($p = 0.001$; $p < 0.05$) (Table 5).

Treatment-related adverse effects by specialty and experience

Specialist physicians demonstrated significantly higher rates of allergic reactions (28.6%) and weakness in adjacent muscles (28.6%) with dentists ($p < 0.05$). Incomplete eyelid closure, eyebrow ptosis, and facial asymmetry were also significantly more frequent among specialist physicians ($p < 0.05$). Dentists (general: 44.4%; specialists: 35.3%) had significantly higher rates of reporting no adverse effects ($p = 0.001$) (Table 6).

Weakness in adjacent muscles was significantly more common among practitioners with 5-10 years of experience (33.3%) ($p = 0.004$). Injection-site burning/stinging pain was significantly more common among those with ≥ 10 years of experience (75%) ($p = 0.001$). Eyebrow ptosis occurred significantly more frequently among practitioners with ≤ 2 years of experience (5%) ($p = 0.031$). No adverse effects were most common among practitioners with ≤ 2 years (30%) and 2-5 years of experience (40%) ($p = 0.008$) (Table 7).

Bruxism management by specialty and experience

Dentists (general and specialists) were significantly more likely to recommend splint therapy ($p = 0.001$), whereas physicians (general and specialists) were significantly more likely to recommend BTX alone ($p < 0.05$). BTX recommendations were significantly higher among practitioners with ≥ 10 and 5-10 years of experience, whereas splint recommendations were more common among those with ≤ 5 years of experience ($p = 0.003$) (Table 8) (Fig. 3).

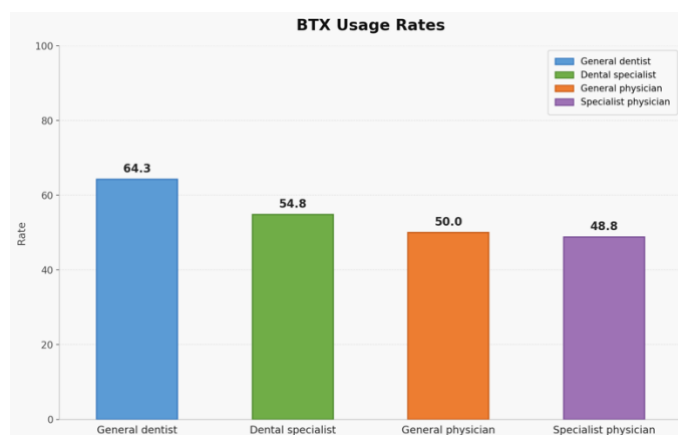


Figure 1. BTX use rates among general dentists, dental specialists, general physicians, and specialist physicians.

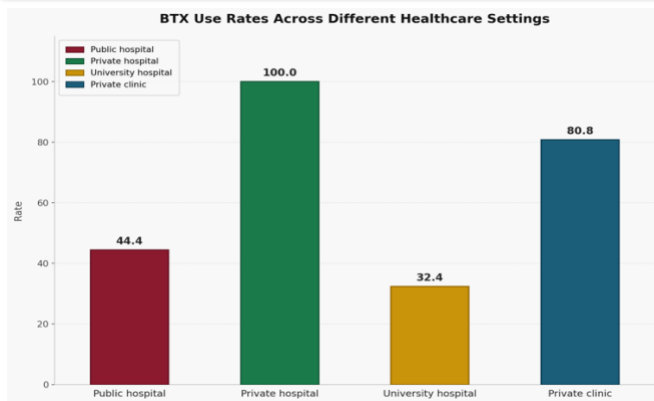


Figure 2. BTX use rates across different healthcare settings.

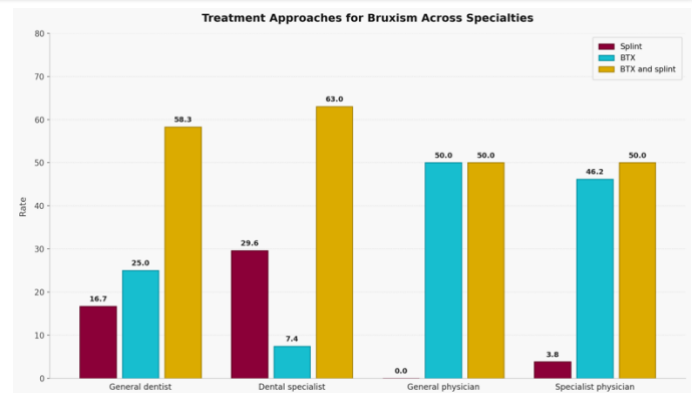


Figure 3. Treatment approaches for patients with bruxism across specialties.

Table 2. Demographic and professional characteristics of the participants.

		n	%
Age	23-30	66	23.9
	31-40	123	44.6
	41-50	63	22.8
	51-60	21	7.6
	61-70	3	1.1
Gender	Female	156	56.5
	Male	120	43.5
Specialty	General dentist	42	15.2
	Prosthodontist	30	10.9
	Oral and maxillofacial surgeon	9	3.3
	Periodontist	15	5.4
	Endodontist	3	1.1
	Oral and maxillofacial radiologist	6	2.2
	Orthodontist	6	2.2
	Specialist in restorative dentistry	15	5.4
	Pediatric dentist	9	3.3
	General physician	12	4.3
	Specialist physician	129	46.7
Workplace	Public hospital	81	29.3
	Private hospital	15	5.4
	University hospital	102	37
	Private clinic	78	28.3
Region	Urban	216	78.3
	Rural	60	21.7

Table 3. Distribution of responses to botulinum toxin (BTX)-related questions.

		n	%
BTX use	Yes	147	53.3
	No	129	46.7
Reasons for not using BTX (n=129)	High cost	21	16.3
	Fear	9	7
	Not necessary	51	39.5

	Risk of adverse effects	15	11.6
	Religious reasons	6	4.7
	Concern about changes in facial expression	12	9.3
Experience (n=147)	More than 10 years	12	8.2
	5-10 years	45	30.6
	2-5 years	30	20.4
	Less than 2 years	60	40.8
BTX administration indications (n=147)	Facial wrinkles	99	67.3
	Strabismus	3	2
	Cervical dystonia / cervical muscle spasm	6	4.1
	Migraine	33	22.4
	Blepharospasm	8	5.4
	Urinary incontinence	3	2
	Hemifacial spasm	6	4.1
	Hyperhidrosis	42	28.6
	Children with cerebral palsy	9	6.1
	Bruxism	111	75.5
	Trigeminal neuralgia	14	9.5
	Masseter hypertrophy	76	51.7
	Myofascial pain	18	12.2
	Trismus	12	8.2
	Gummy smile	72	49.0
Annual number of patients treated with BTX (n=147)	0-20	78	53.1
	20-49	21	14.3
	50-100	24	16.3
	>100	24	16.3

Table 4. BTX use, adverse effects, and bruxism management among participants.

		n	%
BTX formulations used (n=147)	OnabotulinumtoxinA	108	73.5
	IncobotulinumtoxinA	17	11.6
	AbobotulinumtoxinA	96	65.3
	Other	35	23.8
Adverse effects during BTX administration (n=147)	Lack of desired treatment effect	72	49
	Allergic reactions	27	18.4
	Weakness in adjacent muscles	24	16.3
	Localized stinging or burning pain during injection	33	22.4
	Dry eye / Excessive tearing	3	2
	Incomplete eyelid closure	15	10.2
	Brow ptosis	21	14.3
	Eyelid drooping	3	2
	Facial asymmetry	9	6.1
	None	36	24.5
Injection-related adverse effects during BTX administration (n=147)	Pain	84	57.1
	Bruising	72	49
	Erythema	21	14.3
	Edema	18	12.2

	Tenderness	30	20.4
	Headache	36	24.5
	Infection	6	4.1
	Numbness or dysesthesia	3	2
	Vasovagal episode and loss of consciousness	3	2
	None	24	16.3
BTX certification (n=276)	Yes	126	45.7
	No	150	54.3
Recommended treatment for patients with bruxism (n=201)	Splint	33	16.4
	BTX	54	26.9
	BTX and splint	114	56.7
Muscles injected with BTX in patients with bruxism (n=201)	Masseter	195	97
	Temporalis	123	61.2
	Pterygoid	27	13.4

Table 5. Comparison of botulinum toxin (BTX) usage rates by specialty, workplace, and BTX certification status.

		BTX usage rates		p
		Yes n (%)	No n (%)	
Specialty	General dentist	27 (64.3%)	15 (35.7%)	0.361
	Dental specialist	51 (54.8%)	42 (45.2%)	
	General physician	6 (50%)	6 (50%)	
	Specialist physician	63 (48.8%)	66 (51.2%)	
Workplace	Public hospital	36 (44.4%)	45 (55.6%)	0.001*
	Private hospital	15 (100%)	0 (0%)	
	University hospital	33 (32.4%)	69 (67.6%)	
	Private clinic	63 (80.8%)	15 (19.2%)	
BTX certification	Yes	108 (85.7%)	18 (14.3%)	0.001*
	No	39 (26%)	111 (74%)	

Chi-square test *p < 0.05

Table 6. Comparison of adverse effects encountered during botulinum toxin (BTX) administration across specialties.

Adverse effects	General dentist (n=27%) n (%)	Dental specialist (n=51%) n (%)	General physician (n=6%) n (%)	Specialist physician (n=63%) n (%)	p
Lack of desired treatment effect	9 (33.3%)	27 (52.9%)	3 (50%)	33 (52.4%)	0.344
Allergic reactions	0 (0%)	6 (11.8%)	3 (50%)	18 (28.6%)	0.001*
Weakness in adjacent muscles	3 (11.1%)	3 (5.9%)	0 (0%)	18 (28.6%)	0.007*
Localized stinging or burning pain during injection	6 (22.2%)	9 (17.6%)	0 (0%)	18 (28.6%)	0.354
Dry eye / Excessive tearing	0 (0%)	0 (0%)	0 (0%)	3 (4.8%)	0.384
Incomplete eyelid closure	0 (0%)	0 (0%)	0 (0%)	15 (23.8%)	0.001*
Brow ptosis	0 (0%)	0 (0%)	0 (0%)	21 (33.3%)	0.001*
Eyelid drooping	0 (0%)	0 (0%)	0 (0%)	3 (4.8%)	0.384
Facial asymmetry	0 (0%)	0 (0%)	0 (0%)	9 (14.3%)	0.007*
None	12 (44.4%)	18 (35.3%)	0 (0%)	6 (9.5%)	0.001*

Fisher-Freeman-Halton Exact test *p < 0.05

Table 7. Comparison of BTX-related adverse effects according to professional experience.

	More than 10 years (n=12)	5-10 years (n=45)	2-5 years (n=30)	Less than 2 years (n=60)	
Side Effects	n (%)	n (%)	n (%)	n (%)	p
Lack of desired treatment effect	3 (25%)	21 (46.7%)	12 (40%)	36 (60%)	0.081
Allergic reactions	0 (0%)	12 (26.7%)	6 (20%)	9 (15%)	0.153
Weakness in adjacent muscles	0 (0%)	15 (33.3%)	3 (10%)	6 (10%)	†0.004*
Localized stinging or burning pain during injection	9 (75%)	15 (33.3%)	0 (0%)	9 (15%)	0.001*
Dry eye / Excessive tearing	0 (0%)	3 (6.7%)	0 (0%)	0 (0%)	†0.086
Incomplete eyelid closure	3 (25%)	6 (13.3%)	3 (10%)	3 (5%)	†0.139
Brow ptosis	3 (25%)	9 (20%)	6 (20%)	3 (5%)	†0.031*
Eyelid drooping	0 (0%)	3 (6.7%)	0 (0%)	0 (0%)	†0.086
Facial asymmetry	0 (0%)	6 (13.3%)	0 (0%)	3 (5%)	†0.119
None	0 (0%)	6 (13.3%)	12 (40%)	18 (30%)	0.008*

Chi-square test and †Fisher-Freeman-Halton Exact test *p < 0.05

Table 8. Treatment preferences for bruxism according to specialty and professional experience.

		Splint n (%)	BTX n (%)	BTX and splint n (%)	p
Specialty	General dentist	6 (16.7%)	9 (25%)	21 (58.3%)	0.001*
	Specialist Dentist	24 (29.6%)	6 (7.4%)	51 (63%)	
	General Physician	0 (0%)	3 (50%)	3 (50%)	
	Specialist Physician	3 (3.8%)	36 (46.2%)	39 (50%)	
Experience	More than 10 years	0 (0%)	6 (50%)	6 (50%)	0.003*
	5-10 years	0 (0%)	9 (21.4%)	33 (78.6%)	
	2-5 years	3 (10%)	12 (40%)	15 (50%)	
	Less than 2 years	9 (15.8%)	9 (15.8%)	39 (68.4%)	

Fisher-Freeman-Halton Exact test *p < 0.05

Discussion

In recent years, the use of BTX injections has increased because of their effectiveness, acceptability, and minimally invasive nature. Worldwide, BTX is used for both cosmetic and non-cosmetic indications (21-23). As BTX applications continue to expand, understanding practitioners' knowledge, clinical experience, and practice patterns has become increasingly important. In the present study, more than half of the participating medical and dental practitioners reported using BTX in their clinical practice, with bruxism, facial wrinkles, and masseter hypertrophy being the most frequently treated indications. BTX use was found to be significantly higher among practitioners employed in private healthcare settings and those holding formal BTX certification.

However, given the cross-sectional design of the study, this association does not imply a causal relationship. Overall, these findings provide insights into BTX-related practices within the study sample and highlight the potential need for structured training and standardization.

A cross-sectional study from Saudi Arabia and Pakistan found that only 3.51% of dentists clinically administered BTX, although they possessed adequate knowledge regarding its cosmetic applications (54.7%) and potential adverse effects (66.8%). This low usage rate may be related to factors such as limited training, clinical experience, or hesitancy toward adopting BTX as a therapeutic modality (24). Alzarrah et al. (19) reported that most practitioners lacked experience with BTX injection: only 31.43% had treated patients with BTX within the past year.

In contrast to previous studies, the present study showed higher reported rates of BTX usage among participants. A total of 53.3% of practitioners reported using BTX in their clinical practice, which is a higher rate than that previously reported in the literature. Across professional groups, BTX usage was reported by 64.3% of general dentists, 54.8% of dental specialists, 50% of general physicians, and 48.8% of specialist physicians.

BTX was first approved by the U.S. Food and Drug Administration (FDA) in 1989 for several therapeutic indications, including involuntary muscle contractions, strabismus, blepharospasm, hemifacial spasm (25), and the prophylactic treatment of chronic migraine (26). BTX has also been reported to be highly effective in managing hyperhidrosis of the axillae, palms, and soles (27). In 2000, the FDA extended its approval to include the treatment of cervical dystonia (28), followed by the cosmetic management of glabellar frown lines in 2002 (28-30). Since then, BTX has been used to reduce hyperfunctional facial lines correlated with muscles of facial expressions, which is the first aesthetic use for BTX (30), and yet the most popular (31). Consistent with this, Al Hamdan et al. (32) reported that wrinkle reduction (73.7%) was the most commonly recognized BTX indication among participants, followed by the treatment of gummy smile (51%), further highlighting BTX's prominent role in aesthetic practice. In line with these findings, Alfouzan and Mekkawy (20) reported that 88.6% of dental academics considered wrinkle reduction to be the most common indication for BTX use.

Gummy smile is a challenging clinical condition in aesthetic dentistry and can be successfully managed with BTX, in addition to various surgical techniques (33). Alfouzan and Mekkawy (20) reported that 70.6% of participants reported adequate knowledge regarding the use of BTX for gummy smile correction, a proportion higher than the 51% reported in earlier studies (32). Similarly, Laorpipat et al. (18) demonstrated that most dentists were aware of BTX as a treatment option for improving facial aesthetics, particularly gummy smile and managing masseter hypertrophy as well as for treating bruxism; however, more than half remained unaware of its broader therapeutic applications.

The therapeutic applications of BTX have expanded over the years (34). The increasing use of BTX for non-cosmetic purposes has also been reported in a practitioner survey, in which 86% of respondents indicated using BTX to treat cervical dystonia and spastic paresis, along with an increase in the number of patients receiving BTX injections over the past five years (35). Likewise, BTX injections have been reported to be effective in the long-term prophylaxis of chronic migraine and may also be associated with reductions in depressive symptoms and improvements in work productivity (36, 37).

In this study, higher rates of therapeutic BTX utilization compared with previous studies were observed among the participants. It was determined that 75.5% of participants used BTX for bruxism, 67.3% for unwanted facial wrinkles, 51.7% for masseter hypertrophy, and 49% for gummy smile. BTX use was also

reported for various neuromuscular and medical conditions, including hyperhidrosis (28.6%), migraine (22.4%), myofascial pain (12.2%), trigeminal neuralgia (9.5%), trismus (8.2%), cerebral palsy (6.1%), blepharospasm (5.4%), cervical dystonia (4.1%), and hemifacial spasm (4.1%). These findings indicate that BTX was used for a broad range of aesthetic and therapeutic indications within the study sample.

Gower et al. (11) evaluated the awareness of various aspects of BTX among Australian dental practitioners, dental students, and patients. Their findings showed that although BTX was well recognized for cosmetic purposes, awareness of its use in the management of bruxism and TMD was lower, particularly among patients and, among students. These findings are consistent with previous literature (38), which suggests that, despite growing evidence supporting BTX as an effective modality for orofacial pain and dysfunction, both dental students and dental practitioners have limited knowledge of its therapeutic applications. Similarly, Freeman et al. (39) reported a marked knowledge gap, with most patients perceiving aesthetic enhancement as the primary indication for BTX treatment.

In contrast, the present study revealed higher rates of BTX use for bruxism management compared with those reported in the literature. A total of 75.5% of participants indicated that they had administered BTX for bruxism. Treatment preferences were found to differ significantly according to profession: dental practitioners more frequently recommended splint therapy, while medical practitioners were found to have a higher likelihood of preferring BTX. A comparable pattern was observed in muscle selection; the masseter was the most targeted muscle, followed by the temporalis and the pterygoid muscles. Experience-related differences were also evident, with more experienced practitioners favoring BTX therapy, while less experienced practitioners appeared more inclined to recommend splint therapy.

BTX has been used in clinical practice for more than two decades and is generally considered to have a favorable safety profile, with most adverse effects reported as mild and transient (30).

According to the FDA data, the most frequently reported adverse effects include lack of the expected therapeutic effect (63%), injection-site reactions (19%), and ptosis (11%) (28, 30). In contrast, Al Hamdan et al. (32) reported that 81.1% of participants reported the presence of adverse effects, with allergic reactions (57.5%) being the most commonly reported. Similarly, Alfouzan and Mekkawy (20) reported that allergic reactions (40.8%) were the most frequently observed adverse effects, followed by eyelid drooping (34.3%).

In the present study, the most common treatment-related adverse effects were lack of the desired therapeutic effect (49%) and localized stinging or burning pain during injection (22.4%). These findings are consistent with the FDA data. In contrast to previous studies, the prevalence of allergic reactions was lower in this study (18.4 %). Among injection-related adverse effects, pain (57.1%), bruising (49%), and headache

(24.5%) were the most frequently reported. Adverse effects were reported more frequently by medical specialists; however, this finding should be interpreted with caution, as the underlying reasons for this difference cannot be directly determined from the present data.

Alzarrah et al. (19) reported that among the commercially available formulations, abobotulinumtoxinA and onabotulinumtoxinA were the most preferred products in the region. This finding is consistent with previous literature indicating that these two formulations are the most frequently used agents for head and neck indications (40). Consistent with these reports, the present study similarly found that 73.5% of practitioners used onabotulinumtoxinA, 65.3% used abobotulinumtoxinA, and 11.6% used incobotulinumtoxinA. As participants were allowed to select more than one product in this section of the questionnaire, the reported percentages reflect multiple responses and therefore differ from distributions observed in single-response items.

This study contributes to the literature on BTX use in clinical practice by including both medical and dental practitioners, providing a broader perspective compared with previous studies that focused primarily on dentists or cosmetic applications. The higher BTX utilization rates observed in this study, compared with previous reports, may reflect differences in study populations and should be interpreted with caution. Additionally, the evaluation of non-aesthetic therapeutic applications and the identification of differences in treatment preferences for bruxism across professional groups and experience levels offer further insight into clinical practice patterns. Overall, this study provides insight into BTX-related knowledge, attitudes, and practices among participants. The findings suggest a potential need for improved education, standardized certification, and clearer regulatory guidelines to support the safe and effective use of BTX in clinical settings.

Limitations

This study has several limitations. First, the cross-sectional design and reliance on self-reported data may introduce response and recall bias, which could affect the accuracy of reported clinical practices. Second, the online distribution of the questionnaire via social media platforms may have introduced selection bias, as participation was voluntary and may have attracted practitioners with a particular interest or prior experience with BTX. Third, although practitioners from different medical and dental specialties were included, some subgroups were relatively small, which may limit the interpretation of subgroup comparisons. Additionally, although the questionnaire was adapted from previously published studies and reviewed for clarity, no formal validation procedures were performed for the Turkish version. Furthermore, due to the open distribution strategy, a predefined target population and

response rate could not be established. Finally, the absence of formal scale validation may limit the ability to clearly distinguish between knowledge, attitudes, and practice-related constructs measured in the questionnaire.

Conclusion

This study provides an overview of the BTX-related knowledge, attitudes, and clinical practices among medical and dental practitioners in Türkiye. More than half of the participants (53.3%) reported using BTX in their clinical practice, with bruxism (75.5%), facial wrinkles (67.3%), masseter hypertrophy (51.7%), and gummy smile (49%) identified as the most frequently treated indications. OnabotulinumtoxinA was the most used formulation (73.5%), and the most frequently reported treatment-related adverse effects were insufficient therapeutic response (49%) and injection-site pain or burning (22.4%). In bruxism management, a considerable proportion of practitioners preferred a combined approach involving both BTX and splint therapy, and differences in treatment preferences were observed across specialties and experience levels. Overall, within the limitations of this study, BTX appeared to be commonly used among the participants and was applied for a range of clinical indications.

Disclosures

Ethical Approval: The study was approved by the Istanbul Yeni Yüzyıl University Non-Interventional Research Ethics Committee, in accordance with the ethical standards of the Declaration of Helsinki (approval number: 2023/10-1101).

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