

Pathology-informed telemedicine in COPD care: A qualitative study on patient perspectives and medication adherence

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ABSTRACT

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory condition that requires sustained adherence to pharmacological therapy. In regions like Hail City, Saudi Arabia, the burden of COPD is compounded by low health literacy, limited access to care, and poor medication adherence. As healthcare systems increasingly adopt telemedicine, understanding its potential role in supporting treatment adherence becomes essential. This study aimed to explore the perspectives of COPD patients receiving outpatient care at King Salman Specialized Hospital (KSSH) in Hail City regarding medication adherence and their experiences with telemedicine in managing their condition. A qualitative descriptive approach was employed, involving semi-structured interviews with 28 COPD patients. Participants were recruited from the outpatient respiratory clinic at KSSH. Interviews were thematically analyzed to identify barriers and facilitators to medication adherence, as well as attitudes toward telemedicine. Participants demonstrated varied levels of understanding regarding COPD and its treatment. Common barriers to adherence included inhaler misuse, forgetfulness, and insufficient instruction, while facilitators included family support and perceived treatment effectiveness. Many patients were receptive to telemedicine, particularly for follow-up and medication guidance, though concerns were raised about digital literacy and the perceived limitations of remote care. Pathology-informed education and culturally sensitive telemedicine strategies have the potential to enhance adherence among COPD patients. Tailored interventions that address technological, cognitive, and contextual challenges are essential to maximize the impact of digital health solutions in chronic respiratory disease care.

Keywords: Pathology, COPD, Telemedicine, Medication adherence

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a major global health problem, impacting over 210 million people and expected to become the third biggest cause of death by 2030. The condition is distinguished by permanent airflow restriction

and gradual respiratory impairment, which are frequently associated with comorbidities such as cardiovascular disease, diabetes, and depression. Effective management is mainly dependent on persistent usage of maintenance inhalers and adherence to specified treatment regimens. However, nonadherence is a persistent impediment to reaching optimal health outcomes [1, 2].

In Saudi Arabia, COPD management is further complicated by a confluence of clinical, systemic, and social factors. Studies have shown that low health literacy, misconceptions about disease severity, improper inhaler use, and the complexity of treatment regimens significantly hinder adherence [1-3]. Nonadherence among COPD patients may present as underuse, overuse, or incorrect technique, all of which have been associated with

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higher morbidity, more frequent exacerbations, and increased hospitalization rates [1].

Crucially, a patient's understanding of COPD pathology plays a pivotal role in shaping adherence behaviors. Patients who acknowledge the progressive nature of their illness and comprehend the therapeutic rationale behind inhaled medications are more likely to follow treatment plans consistently [3]. Nevertheless, qualitative research exploring this relationship—particularly within Gulf countries—remains limited.

Within this context, telemedicine has emerged as a promising tool to enhance access to care, improve continuity, and support disease self-management. It enables remote consultations, medication monitoring, and patient education—capabilities that are particularly beneficial in rural or underserved settings [2]. Despite its advantages, the adoption of telemedicine is often impeded by technological barriers, limited digital literacy, and a lack of confidence in virtual consultations, particularly among patients [4, 5] with chronic illnesses such as COPD [6].

To address these gaps, this study explored the lived experiences of COPD patients in managing [7-9] their disease through both traditional and telemedicine-supported care. Conducted at King Salman Specialized Hospital (KSSH) in Hail City, Saudi Arabia, the study employed in-depth interviews with 28 outpatients to examine how patients' perceptions of COPD pathology, their use of telemedicine, and their daily routines influence medication adherence. Ethical approval was obtained from the Hail Health Cluster (Approval No. 17/2024).

By capturing patient narratives, this study contributes to a deeper understanding of how telemedicine can be tailored to support pathology-informed, patient-centered care strategies aimed at improving adherence and long-term outcomes in COPD management.

Materials and Methods

Study design

This study employed a qualitative descriptive design, which is well-suited for exploring complex health behaviors and lived experiences. This approach enabled a nuanced understanding of how patients with chronic obstructive pulmonary disease (COPD) perceive their condition, adhere to prescribed medications, and engage with telemedicine-based care.

Study setting and participants

The study was conducted in the outpatient pulmonary care department at King Salman Specialized Hospital (KSSH), a tertiary care institution located in Hail City, Saudi Arabia. Participants were selected using purposive sampling, targeting adult patients with a confirmed diagnosis of COPD who had participated in at least one telemedicine consultation and were prescribed inhaled maintenance therapy.

A total of 28 patients were recruited. Inclusion criteria were (1) a diagnosis of COPD confirmed by a pulmonologist, (2) age 40 years or older, (3) regular outpatient follow-up at KSSH, (4) at least one prior experience with telemedicine or telephone-based consultation related to COPD, and (5) the ability and willingness to provide informed consent. Patients with severe cognitive impairment or comorbid psychiatric conditions were excluded to ensure accurate and meaningful participation.

Ethical considerations

Ethical approval was obtained from the Hail Health Cluster (Approval No. 17/2024). All participants provided both verbal and written informed consent prior to data collection. They were assured of confidentiality and anonymity, and all personally identifiable information was removed during transcription and data handling.

Data collection

Data were collected through semi-structured, face-to-face interviews conducted in Arabic by a trained qualitative researcher between January and March 2025. Interviews were held in private consultation rooms within the clinic to ensure participant comfort and privacy.

The interview guide covered five main domains:

- Participants' understanding of COPD pathology and treatment goals
- Daily medication-taking behavior and barriers to adherence
- Experiences with inhaler use and communication with healthcare providers
- Perceptions of telemedicine, including trust and ease of use
- Recommendations for improving remote care and follow-up systems

Each interview lasted approximately 30 to 45 minutes and was audio-recorded with participant permission. Field notes were also taken to capture nonverbal cues and contextual observations.

Data analysis

Interviews were transcribed verbatim and translated into English for coding. The data were analyzed using thematic analysis, following the six-phase framework proposed by Braun and Clarke (2006):

1. Familiarization with the data
2. Generation of initial codes
3. Searching for themes
4. Reviewing themes
5. Defining and naming themes
6. Producing the report

Coding was conducted manually and refined iteratively by two independent researchers to enhance credibility. Discrepancies

were resolved through discussion and consensus. NVivo software was optionally used to assist with organizing the data.

Rigor and trustworthiness

To ensure credibility, transferability, dependability, and confirmability, the study employed several strategies, including member checking, peer debriefing, and maintenance of an audit trail. Direct quotations from participants were used to illustrate themes and preserve the authenticity of patient voices.

Results and Discussion

A total of 28 COPD patients were interviewed at King Salman Specialized Hospital (KSSH) in Hail City. Of the participants, 13 were male and 15 were female [10-13], with an age range between 25 and 60 years. The educational backgrounds varied: 9 participants had completed high school, 15 held bachelor's degrees, and 4 had postgraduate qualifications. Participants also differed in disease severity, exposure to telemedicine, and familiarity with digital tools.

Thematic analysis of the interviews revealed five main themes, reflecting patients' understanding of COPD, experiences with medication adherence, and perspectives on using telemedicine.

Table 1. Demographic Data

Variables	Number
Gender:	-
Male	13
Female	15
Age Range	25- 60
Education Level :	-
High School	9
Bachelor	15
Postgraduate	4
Total Participants	28

Theme 1: understanding of COPD pathology

Despite all participants being diagnosed with COPD, most demonstrated limited understanding of the disease. Many described their condition in vague terms, referring to it simply as "breathing problems" or "chest tightness." Several initially attributed their symptoms to aging or temporary smoking effects.

"I thought it was normal to be out of breath as I'm getting old. No one told me it's something that doesn't go away." (P3)

Some participants reported realizing the seriousness of COPD only after multiple hospitalizations.

"When I kept going to the hospital every few months, then I realized it's serious. Before that, I just ignored it." (P19)

A lack of tailored education during diagnosis contributed to misconceptions, with many recalling that clinical terms like

"bronchitis" or "obstruction" were used without proper explanation.

Theme 2: barriers to medication adherence

Participants reported several barriers to consistent medication use:

- *Inhaler misuse:* Many were unaware of the proper technique, especially the coordination of inhalation and actuation.

"I was just spraying and breathing; I didn't know you have to wait or breathe deeply." (P12)

- *Forgetfulness and lack of routine:* Some participants admitted to skipping medications when they felt well.

"If I feel fine, I skip it. I only remember when I'm coughing or can't breathe." (P7)

- *Regimen complexity:* Participants on multiple medications often felt confused about timing and proper usage.

"One is morning, one is evening, and sometimes I forget which is which. It's too much." (P22)

Theme 3: trust and perception of telemedicine

Participants expressed mixed views about telemedicine:

- *Appreciated for convenience:* Particularly helpful during times of fatigue, poor weather, or long travel.

"Sometimes it's hard to come, especially in winter or when I'm tired. So yes, talking on the phone helps." (P9)

- *Skepticism about remote diagnosis:* Many expressed a preference for in-person evaluation.

"On the phone, how will they know if I'm really okay? I want the doctor to check my chest, hear me breathe." (P14)

- *Digital literacy challenges:* Some participants, particularly older ones, struggled with using telehealth platforms.

"My son uses the app. I don't know how to use it, and sometimes I miss the appointment." (P5)

Theme 4: facilitators of adherence

Several factors supported adherence:

- *Family involvement:* Reminders and assistance with medication were often provided by spouses or children.

"My wife reminds me every morning. She learned how to use the spray with me." (P8)

- *Symptom-triggered motivation:* Shortness of breath reminded patients to take their medication.

"If I don't take it, I can't breathe. That's what reminds me more than anything." (P2)

- *Simplified instructions:* Patients benefited from repeated in-clinic demonstrations.

"The nurse showed me many times how to use the spray. I think I'm doing it right now." (P20)

Theme 5: recommendations for improving telemedicine services

Participants shared several suggestions:

- **Cultural relevance:** Use of Arabic-language videos was a common request.

"If there is a short video in Arabic, we can watch it at home when we forget." (P24)

- **Hybrid models:** Many preferred a blend of in-person and remote follow-ups.

"I'm okay with calls, but sometimes I need to be seen. Maybe once every few visits, they check me in person." (P17)

- **Clearer communication:** Avoiding overly technical terms helped patients better understand their care.

"Sometimes they speak in difficult medical terms. Just speak our language clearly; that's enough." (P21)

Summary of results

This study highlights the complex relationship between disease understanding, treatment [14, 15] adherence, and telemedicine use among COPD patients. While telemedicine is valued for convenience, many patients still rely on face-to-face care for reassurance. Key facilitators of adherence included family involvement, simplified communication, and cultural sensitivity in both in-person and digital healthcare delivery.

Table 2. Study Themes

Theme	Key Insights	Illustrative Quote
Understanding COPD Pathology	Limited understanding of disease; symptoms often attributed to aging or smoking.	"I thought it was normal to be out of breath as I'm getting old." (P3)
Barriers to Medication Adherence	Challenges included inhaler misuse, forgetfulness, and regimen complexity.	"Sometimes I use the wrong spray; I get confused." (P6)
Trust and Perception of Telemedicine	Mixed views: valued convenience but missed face-to-face reassurance.	"On the phone, how will they know if I'm really okay?" (P14)
Facilitators of Adherence	Family support, worsening symptoms, and repetition helped adherence.	"My wife reminds me every morning." (P8)
Recommendations for Telemedicine	Suggestions included Arabic video guides, hybrid models, and local dialect use.	"If there is a short video in Arabic, we can watch it at home." (P24)

Summary of results

This study highlights a complex relationship between COPD pathology, medication adherence, and telemedicine use. While patients value convenience, their disease perceptions, digital literacy, and need for human connection strongly influence how they engage with treatment and care. Education, family

involvement, and culturally tailored support systems were found to be key enablers of adherence and satisfaction with telemedicine.

This study aimed to explore how patients with COPD in a tertiary care setting perceive their disease, adhere to medications, and engage with telemedicine-based services. Through thematic analysis of 28 in-depth interviews, we uncovered critical factors that influence both medication behavior and attitudes toward digital health systems in a population with chronic respiratory pathology.

Interpretation of key findings

The findings highlight a significant gap between the clinical understanding of COPD pathology and patients' personal perceptions, with many participants attributing symptoms to aging or past smoking rather than recognizing the progressive and incurable nature of the disease. This misalignment mirrors findings from George *et al.* (2007) and Giacomini *et al.* (2012) and also reflects the broader need for integrating pathology education into pharmacy consultations, as emphasized by Greene *et al.* (2008) and Tan *et al.* (2013) [3, 6, 16, 17].

A deeper appreciation of disease mechanisms could empower patients to adhere more effectively to long-term treatment plans. The literature supports that pathology-informed pharmacological education enhances both comprehension and self-efficacy in managing chronic illnesses [18, 19]. Our findings further suggest that visual tools and simplified communication strategies, particularly those delivered in the patient's dialect, could mitigate misconceptions and enhance engagement—especially among older adults with low health literacy [2].

Medication nonadherence observed in this study—particularly related to improper inhaler technique and inconsistent use during asymptomatic phases—is consistent with international literature highlighting the multidimensional nature of adherence behavior [1, 20]. The use of complex regimens, polypharmacy, and lack of coordination between medications and delivery devices compound the challenges faced by COPD patients, particularly when they are not adequately supported through follow-up care [18, 21].

From a systems perspective, our findings support the role of pharmacist-led interventions in improving adherence, particularly when pharmacists are trained to deliver patient-specific pathology education and device counseling [17, 22, 23]. Importantly, the presence of family support and clear instructions from care teams emerged as facilitators of adherence, reinforcing the value of personalized care models in chronic disease management [6].

Perspectives on telemedicine

Participants expressed diverse views on telemedicine. While its convenience was appreciated by some, others raised concerns about the lack of physical examination, limited visual interaction, and difficulties in expressing symptoms accurately over the phone. This finding is aligned with emerging qualitative studies

on patient-pathologist interactions, where lack of face-to-face communication was linked to decreased patient confidence [24]. Interestingly, patient feedback in our study resonates with the findings from Alshammari *et al.* (2023) [25], where users of the Wasfaty electronic prescription system expressed satisfaction with the system's ease of use and reliability. Our participants similarly recommended telemedicine systems to include visual demonstrations, video support, and follow-up calls—practices that align with Wasfaty's patient-centered approach and could bridge the confidence gap in remote consultations.

Moreover, our study underscores the importance of culturally appropriate, pathology-informed telemedicine models that extend beyond transactional consultations to reinforce patient education and long-term adherence. This approach mirrors recommendations in systems pharmacology, where patient behavior and molecular pathology are viewed in synergy rather than isolation [21].

Implications for practice

The findings have implications at both the clinical [26, 27] and policy levels. First, pharmacists and primary care providers should receive training to incorporate pathology education into COPD management, using tools that simplify complex clinical concepts without diluting their significance [16, 19].

Second, telemedicine systems must be restructured to reflect the needs of multipathological and older patients, many of whom struggle with digital interfaces or need repeated visual guidance [18]. Including family members in consultations and offering personalized support through audio-visual media could mitigate some of these challenges.

Additionally, health systems should implement hybrid care models that balance remote and face-to-face visits, especially during critical phases such as initial diagnosis, medication initiation, or exacerbation follow-up.

Strengths and limitations

This study contributes novel, culturally grounded insights into COPD care in Saudi Arabia, particularly within a tertiary outpatient setting. The inclusion of pathology and telemedicine as joint thematic lenses offers a multidisciplinary view that is often absent from single-theme qualitative studies [20, 23]. However, the study is limited by its focus on one institution and may not fully represent rural or technologically underserved populations. Furthermore, self-reporting bias is a known limitation in qualitative research, although triangulation through researcher reflexivity and direct quotes enhanced credibility.

Conclusion

This qualitative study explored the experiences of COPD patients in Hail City, Saudi Arabia, regarding medication adherence and telemedicine use in a tertiary outpatient setting. The findings highlight a critical need for enhanced patient education, particularly about the chronic and progressive nature

of COPD. Many participants lacked a clear understanding of their condition, which significantly influenced their adherence to prescribed therapies. These findings are consistent with previous research emphasizing the importance of disease perception in adherence behavior [3, 6, 16].

Although telemedicine was valued for its convenience and accessibility, participants expressed concerns about the absence of physical examination and challenges in effectively communicating symptoms. These concerns reflect broader findings in the literature regarding the limitations of remote care without appropriate educational or visual support mechanisms [2, 24]. Notably, participants suggested the integration of Arabic-language video instructions and the adoption of hybrid care models that combine remote and in-person follow-ups. These suggestions align with the positive feedback reported by users of the Wasfaty e-prescription platform, which was praised for its user-friendliness and reliability [25].

Pharmacists were frequently identified as key figures in improving treatment [28, 29] adherence, particularly through counseling on inhaler techniques and providing individualized education. This aligns with previous findings that highlight the value of pharmacist-led interventions in managing chronic illnesses, especially among elderly and multi-pathological patients [18, 22]. Given the multifaceted nature of COPD management, integrating pathology-informed education into pharmacy practice and telemedicine models is essential. Such integration reflects the principles of systems pharmacology, which advocate for a synergistic understanding of disease pathology, patient behavior, and treatment response [19, 21].

To improve care outcomes, it is recommended that pathology-informed and culturally tailored education be incorporated into routine clinical consultations. Telemedicine services should be enhanced by including Arabic-language visual tools and ensuring structured, continuous follow-up, preferably within hybrid models that balance digital and in-person care. Pharmacists should be actively involved in telehealth services to provide ongoing support for medication use and device training. Moreover, involving family caregivers in adherence strategies can further support patients with limited literacy or physical independence. Policies should be developed to support the expansion of multidisciplinary and culturally sensitive telehealth systems that are responsive to the specific needs of COPD patients in Saudi Arabia and similar contexts [1, 21].

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References

- Restrepo RD, Alvarez MT, Wittnebel LD, Sorenson H, Wettstein R, Vines DL, et al. Medication adherence issues in patients treated for COPD. *Int J Chron Obstruct Pulmon Dis*. 2008;3(3):371–84. doi:10.2147/copd.s3036
- López-Campos JL, Quintana Gallego E, Carrasco Hernández L. Status of and strategies for improving adherence to COPD treatment. *Int J Chron Obstruct Pulmon Dis*. 2019;14:1503–15. doi:10.2147/COPD.S170848
- George J, Kong DCM, Stewart K. Adherence to disease management programs in patients with COPD. *Int J Chron Obstruct Pulmon Dis*. 2007;2(3):253–62. doi:10.2147/copd.s12159959
- Samyuktha PS, Syam S. Periodontal abscess as a clinical oral sign in patients with diabetes mellitus - an original study. *Bull Pioneering Res Med Clin Sci*. 2024;3(2):7–12. doi:10.51847/ZDpdihizWm
- Goyal S, Singh S, Dalal K, Goyal S. The impact of Vitamin D in ulcerative colitis patients among a tertiary care centre. *Bull Pioneering Res Med Clin Sci*. 2024;3(2):1–6. doi:10.51847/2oJxwMjShf
- Giacomini M, DeJean D, Simeonov D, Smith A. Experiences of living and dying with COPD: a systematic review and synthesis of the qualitative empirical literature. *Ont Health Technol Assess Ser*. 2012;12(13):1–47.
- Alnemer S, Alajlan AM, Alqarni AN, Alshanbari SH, Alhejazi MA, Matrood MA, et al. Knowledge and practices of riyyadh-based dentists in managing traumatic dental injuries. *Ann J Dent Med Assist*. 2022;2(1):22–5. doi:10.51847/ZGZXliiSUR
- Kumar D, Gurunathan D, Jabin Z, Talal S. Comparative efficacy of aromatherapy and conscious sedation in pediatric dental anxiety management. *Ann J Dent Med Assist*. 2022;2(1):14–21. doi:10.51847/TVRFhVailQ
- Spirito FD, Iacono VJ, Alfredo I, Alessandra A, Sbordone L, Lanza A. Impact of COVID-19 awareness on periodontal disease prevention and management. *Asian J Periodontics Orthod*. 2022;2:16–26. doi:10.51847/t8D9TJGOCU
- Mobeen T, Dawood S. Studying the effect of perceived social support and mental health on marital burnout in infertile women. *J Integr Nurs Palliat Care*. 2022;3(1-2022):7-12. doi:10.51847/7DkM3Fkiu3
- Liu M, Tang Q, Wang Q, Xie W, Fan J, Tang S, et al. Studying the sleep quality of first pregnant women in the third trimester of pregnancy and some factors related to it. *J Integr Nurs Palliat Care*. 2022;3(1):1–6. doi:10.51847/K1PUWsJ24H
- İlhan N, Telli S, Temel B, Aştı T. Investigating the sexual satisfaction mediating role in the relationship between health literacy and self-care of men with diabetes and women's marital satisfaction. *J Integr Nurs Palliat Care*. 2022;3(1-2022):19-25. doi:10.51847/sFjL3OLpqq
- Enwa FO, Jewo AO, Oyubu LO, Adjekuko CO, Effiong V. Incidence of vaginal infections among females of different age categories in Delta State, Nigeria. *Bull Pioneering Res Med Clin Sci*. 2022;1(1):18–23. doi:10.51847/C1oahQ115n
- Maneca ASB, Alqahtani AD, Alhazaa AK, Albalawi AO, Alotaibi AK, Alanazi TF. Systematic review of the microbiological impact of sodium hypochlorite concentrations in endodontic treatment. *Int J Dent Res Allied Sci*. 2024;4(2):9–15. doi:10.51847/PH80PpWOX7
- AlHussain BS, AlShehri AM, AlRasheed MA, AlGadhi SK, AlAhmad FA. A systematic review on endodontic retreatment and the effective removal of endodontic sealers using lasers. *Int J Dent Res Allied Sci*. 2023;3(1):8-16. doi:10.51847/m7WmmgNWH1
- Greene RJ, Harris ND, Goodyer LI. Pathology and therapeutics for pharmacists: a basis for clinical pharmacy practice. 3rd ed. London: Pharmaceutical Press; 2008.
- Tan KB, Lim YC, Chui WK, Teh M, Nga ME. Pathology for pharmacy students: practical measures that enhance the learning experience. *Pharm Educ*. 2013;13(1):125-8.
- Delgado Silveira E, Fernández-Villalba EM, García-Mina Freire M, Albiñana Pérez MS, Casajús Lagranja MP, Peris Martí JF. The impact of Pharmacy Intervention on the treatment of elderly multi-pathological patients. *Farm Hosp*. 2015;39(4):192-202.
- Mohammad AA, Chin OS, Elnaem M. Understanding diabetes management among patients in Hail City using the Health Belief Model. *J Adv Pharm Educ Res*. 2024;14(4):28-33.
- Marin JG, Macias RI, Briz O, Banales JM, Monte MJ. Bile acids in physiology, pathology and pharmacology. *Curr Drug Metab*. 2016;17(1):4-29.
- van der Greef J, McBurney RN. Innovation: rescuing drug discovery: in vivo systems pathology and systems pharmacology. *Nat Rev Drug Discov*. 2005;4(12):961-7. doi:10.1038/nrd1904
- Tan EC, Stewart K, Elliott RA, George J. Stakeholder experiences with general practice pharmacist services: a qualitative study. *BMJ Open*. 2013;3(9):e003214. doi:10.1136/bmjopen-2013-003214
- Mawhinney M, Mariotti A. Physiology, pathology and pharmacology of the male reproductive system. *Periodontol* 2000. 2013;61(1):232-51.
- Lapedis CJ, Kroll-Wheeler L, DeJonckheere M, Johnston D, Owens SR. Broadening the scope: a qualitative study of pathologists' attitudes toward patient-pathologist interactions. *Am J Clin Pathol*. 2021;156(6):969–79. doi:10.1093/ajcp/aqab144
- Alshammari AM, Aljabreen AK, Alramal AK, Alshammari NN. Efficiency for the implantation Wasfaty prescription programme from the patient's perspective: a focus-group study. *J Adv Pharm Educ Res*. 2023;13(4):36-8. doi:10.51847/9b1TqyNcB1

26. Patatou A, Iacovou N, Zaxaria P, Vasoglou M, Vasoglou G. Corticotomy-assisted orthodontics: biological basis and clinical applications. *Ann Orthod Periodontics Spec.* 2022;2:8–13. doi:10.51847/0qGERVSoQm
27. Pavlova Z. Material properties and clinical performance of 3d-printed complete dentures: a systematic review. *Ann Orthod Periodontics Spec.* 2024;4(1-2024):14-25. doi:10.51847/62izsGtXh4
28. Harmouche L, Courval A, Mathieu A, Petit C, Huck O, Severac F, et al. A Split-mouth study comparing photodynamic therapy and scaling and root planning in the treatment of chronic periodontitis. *Turk J Public Health Dent.* 2022;2(2):23-30. doi:10.51847/0UkmY1pJvP
29. Alharbi IS, Alharbi AS, Ansari SH. Public awareness and perceptions of orthodontic treatment with invisalign in Qassim, Saudi Arabia. *Turk J Public Health Dent.* 2022;2(1):13-8. doi:10.51847/DrpPRdrDrf