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Original Article

Exploring the determinant of flu vaccine hesitancy among Turkish population: a cross-sectional study

Muhammed Yunus Bektay[1*], Mehmet Halit Ulaş [2]

Abstract

Background: Although influenza is a contagious and widespread viral disease, its impact on public health is controlled by vaccination programs. However, anti-vaccination sentiment is also increasing in society. This study aims to explore the factors influencing influenza vaccine hesitancy.

Methods: Between November 2020 and January 2021, a cross-sectional observational survey was carried out in Turkey. To investigate the extent of vaccine hesitancy among individuals, an online questionnaire was created using Google Forms. Data were collected using an exponential non-discriminative snowball sampling technique. Besides internal consistency reliability, chi-square was performed. Statistical significance was defined as $p < 0.05$.

Results: This research encompassed a cohort of 172 respondents, with an average age of 53.5±14.3 years within the total sample. Most participants (126, 73.25%) were above 45. The participant group was predominantly female (93, 54.1%), and most had achieved a high school or university education (117, 66.2%). Out of the participants, 123 individuals (71.5%) reported having a chronic ailment. Among the 172 participants, 118 (68.6%) exhibited no reluctance to receive the influenza vaccine, while 54 (31.4%) expressed vaccine hesitancy. There was a notable statistically significant distinction in the level of knowledge regarding influenza vaccines ($p<0.001$, $\chi^2= 20.482$).

Conclusion: Lack of information, perceived harms, lack of trust in pharmaceutical companies, and experiences are among the most important determinants of anti-vaccination. Pharmacists may have a potential role in the leading part of the healthcare team in the fight against anti-vaccination in the community.

Keywords: Influenza, Vaccine Hesitancy, Clinical Pharmacist, Influenza Vaccine, Determinants, Turkiye

Background

In the modern world, influenza poses a substantial health concern. The annual occurrence of seasonal influenza results in approximately 3 to 5 million instances of severe illness, leading to approximately 250,000 to 500,000 deaths worldwide [1,2]. The majority of influenza-related mortalities are common with the most susceptible segments of the global population, young children, pregnant women, the elderly, and individuals with chronic illnesses. Despite the severity of influenza, achieving high rates of influenza vaccine adoption within targeted high-risk groups remains a persistent global challenge [2,3].

*Correspondence: yunusbektay@gmail.com
[1]Department of Clinical Pharmacy, Faculty of Pharmacy, Bezmialem Vakif University, 34093, Istanbul, Turkey

A full list of author information is available at the end of the article

Vaccine hesitancy has been recognized by the World Health Organization (WHO) as a significant concern for global health, posing the potential to slow down the advancements in the control of preventable diseases. Furthermore, WHO highlights the substantial impact of vaccination, averting between two and three million mortalities annually [1]. The influenza vaccination initiative 2019 2020, for instance, is estimated to have thwarted 7.5 million cases of influenza, prevented 3.7 million medical consultations associated with influenza, curbed 105,000 influenza-related hospitalizations, and averted 6300 influenza-related deaths [4,5]. Mathematical modeling studies have underlined the potential increase in vaccination hesitancy, indicating that such behavior could precipitate a notable rise in influenza-related mortality, potentially reaching a 7.6-fold increase. Moreover, it has been pointed out that a higher prevalence of vaccine hesitancy contributes to an increased need for medical interventions in managing influenza cases [6].

Recently, numerous researchers have focused their attention on exploring potential barriers to vaccine hesitancy [7–9]. A notable contribution in this regard has been made by the WHO SAGE working group, which introduced the concept of vaccine hesitancy. This construct explores the spectrum of vaccine acceptance, spanning from complete acceptance of all vaccines to complete refusal of any vaccine [10]. According to their findings, "Vaccine hesitancy refers to a delay in acceptance or refusal of vaccination despite the availability of vaccination services. Vaccine hesitancy is complex and context-specific, varying across time, place, and vaccines" [11]. Many studies investigating factors influencing the acceptance of influenza vaccination among fragile populations offer preliminary insights into comprehending hesitancy towards influenza vaccines in pregnant women [12–14], the elderly [15,16], healthcare personnel [17,18], and the general public [19,20]. Vaccine hesitancy can be analyzed from various perspectives. The model presented by the SAGE working group suggests that factors such as individual and social influences, contextual factors, and vaccine-related concerns contribute to this phenomenon [7,10]. One of the most critical approaches to solving problems is using perspectives from different disciplines via gathering multidisciplinary medical teams. This team should bear physicians, nurses, infection specialists, pharmacists, etc. Pharmacists are vital in enhancing patient well-being through their evolving patient-oriented approach [21–23]. Public health services, which are one of the essential roles of pharmacists, provide significant contributions to the health status of society, especially in preventing infectious diseases. As important healthcare professionals, pharmacists possess the capacity to educate patients and society about influenza viruses and prevention and influence societal perspectives about vaccination. Furthermore, using pharmacies for vaccination efforts has yielded favorable outcomes during pandemics. Pharmacist-led vaccination services have progressively evolved since the late 20th century. These initiatives originated in the USA, Australia, Argentina, and South Africa, later expanding to European and non-European countries [24–26]. A comprehensive review and meta-analysis have demonstrated that pharmacist involvement in vaccination programs, encompassing education, facilitation, and administration, has resulted in increased vaccination rates [26]. The International Federation of Pharmacists (FIP) has been firmly committed to enhancing vaccination coverage through pharmacist engagement and has promoted pharmacy-based vaccination for over a decade [27]. The diversity of variables across various parts of the world and cultures contributes to differing perspectives on influenza vaccine hesitancy. This study aimed to explore the determinants of vaccine hesitancy (a phenomenon that is becoming increasingly prevalent within our society) within the Turkish population.

Methods

Study design and setting

Between November 2020 and January 2021, a cross-sectional observational investigation was carried out in Turkey. Participants were not confined to any groups; their involvement was predicated upon their voluntary engagement in the study.

Inclusion and exclusion criteria

Individuals who digitally approved the informed consent form, who were over the age of 18 and living in Türkiye were included in the study. The exclusion criteria were determined as not signing the informed consent form and lacking the necessary cognitive abilities.

Sample size

The exponential non-discriminative snowball sampling technique was employed to recruit participants. The study adheres to the reporting guidelines outlined by the CROSS (A Consensus-Based Checklist for Reporting of Survey Studies) standards [28]. The Raosoft sample size calculator software was employed to determine the sample size. With a 95% confidence interval and 5% margin of error, the required sample size to achieve a Type 1 error (α) of 5% and a Type II error (β) of 85% was calculated to be at least 150. Considering a 15% non-response rate for the total sample, the necessary sample size becomes 172.

Study tool

To investigate the extent of vaccine hesitancy among individuals, an online questionnaire was created using Google Forms. The questionnaire was distributed through various channels, such as email, direct messages, and social media platforms, accompanied by study details. Respondents were prompted to share the survey link within their social networks to encourage broader participation. The questionnaire encompassed four segments: demographics, vaccination behavior and history, knowledge level, and information sources concerning influenza vaccinations, 15 items in total. Before participation, respondents provided electronic approval to a consent form, ensuring the uniqueness of each response. A hyperlink to the consent form was embedded within the online survey for individual reference. Measures were implemented to restrict submissions to one per participant, and verification against physical forms was conducted to verify participant identities. Based on the existing literature, the researchers designed the questionnaire, incorporating dichotomous and three-point Likert scale (ranging from 1 - Agree to 3 - Disagree) questions to assess factors influencing vaccine hesitancy. The primary variable of interest was vaccine hesitancy, measured through a self-evaluated dichotomous item. The study encompassed multiple independent variables exploring vaccination history, knowledge level, and sources of information regarding influenza vaccinations. A panel of three experts provided insights on the language and design of the survey, leading to revisions based on their recommendations. Furthermore, the questionnaire underwent pre-testing with two individuals experienced in behavior change education. This process involved retrospective cognitive interviews to assess content, format, and wording. A pilot study involving ten participants not part of the initial evaluation provided valuable feedback, enhancing clarity and comprehensibility. Subsequently, a separate group of twenty-five participants, distinct from the original dataset, completed the questionnaire over two weeks. The survey's completion time ranged between 10 to 15 minutes. To ascertain test-retest reliability, a subset of 15 participants underwent evaluation using the Spearman correlation coefficient, Wilcoxon test, and intraclass correlation

coefficient (ICC). The results demonstrated an insignificantly low correlation of 0.324 (p>0.05) and an ICC of 0.376 (95% CI: 0.098-0.596, F: 1.602, p<0.001). The questionnaire's reliability was further assessed using Cronbach's alpha test, yielding a value of 0.557 for the survey instrument employed in this study.

Dependent and independent variables

In this study, the dependent variable was identified as vaccine hesitancy. Vaccine hesitancy was investigated by a self-evaluated dichotomous (yes/no) item. The independent variables were sociodemographic data, vaccination behavior, vaccination attitude, and vaccination history, level of knowledge, and sources of information about influenza vaccines.

Statistical analysis

Continuous variables were summarized using descriptive statistics, including mean, median, standard deviation, and interquartile range (IQR), while categorical variables were presented as frequencies and percentages. The normality of continuous variables was assessed through Kolmogorov-Smirnov, and Shapiro-Wilk tests, Q-Q plots, histogram and density analysis, skewness, and kurtosis values. Missing data were excluded from analysis, and Statistical Package for Social Science (SPSS) version 26® and Jamovi version 1.6 software were used for statistical analysis. Statistical significance was defined as $p < 0.05$.

Results

Socio-demographic characteristics of study participants

This study involved 172 participants with an average age of a total sample of 53.5±14.3. The majority of participants (126, 73.25%) were older than 45 years old. A large proportion of participants (118 68,6%) were not vaccine-hesitant. The sample was primarily female (93, 54.1%), and the majority had graduated at least high school or university (117, 66.2%). The demographic characteristics of the sample are presented in Table 1. About the increased age of participants, the number of participants with at least one comorbidity is 123 (71.5%). Among the participants, 123 (71.5%) reported a chronic disease. Specifically, 68 (35.93%) participants reported having hypertension, 36 (20.93%) reported having type 2 diabetes, 14 (8.14%) reported having dyslipidemia, and 5 (2.91%) reported having heart failure. Notably, hypertension was the most frequently reported chronic disease among the participants which is followed by type 2 diabetes mellitus.

Table 1: Sociodemographic Characteristics of Participants (n=172)

Variables	Total N (%)	Non-Vaccine Hesitant N (%)	Vaccine Hesitant N (%)	p-value
Observations	**172 (100)**	**118 (68.6%)**	**54 (30.4)**	NA
Age, Mean ±SD				
18-25 years	15 (8.7)	13 (11.0)	2 (3.7)	> 0.05
26-45 years	31 (18.0)	19 (16.1)	12 (22.2)	
46-65 years	46 (26.7)	28 (23.7)	18 (33.3)	
>65 years	80 (46.5)	58 (49.2)	22 (40.7)	
Gender				> 0.05*
Male	79 (45.9)	49 (41.5)	30 (55.6)	
Female	93 (54.1)	69 (58.5)	24 (44.4)	
Level of Education				P = 0.051*; χ^2 =7.355
Primary School	9 (5.2)	4 (3.4)	5 (9.3)	
Secondary School	49 (28.5)	40 (33.9)	9 (16.7)	
High School	57 (33.1)	36 (30.5)	21 (38.9)	
Graduate	57 (33.1)	38 (32.2)	19 (35.2)	
Comorbidity				> 0.05*
Yes	123 (71.5)	87 (73.7)	36 (66.7)	
No	49 (28.5)	31 (26.3)	18 (33.3)	

* Chi-Square test,

Vaccination behavior and vaccination history for influenza vaccinations

Amon 172 participants, 118 (68.6%) of them were not hesitant to have influenza vaccine. However, 54 (31.4%) of them have expressed themselves as vaccine-hesitant. The vaccination behavior and the vaccination history of the participants are given in Table 2. Among the total sample, more than half of the participants (92, 53.5%) were not vaccinated against the influenza virus. Even though some participants were vaccine-hesitant, there was an inconsistency in which those participants were vaccinated for influenza within the last two years (5, 9.3%). There was a statistically significant difference between the vaccinated participants in the last two years (p<0.001, χ^2= 43,906). The most common reason for the non-vaccination was the perceived harm due to side effects for the total sample, non-vaccine hesitant and vaccine-hesitant, respectively (73, 57.9%, 30, 41.7%, 43, 79.6%; p<0.001, χ^2= 18,901). The willingness to be vaccinated was another item to explore the determinants of vaccine hesitancy. Many of the participants were eager to have influenza vaccine in the future for the total sample, non-vaccine hesitant and vaccine-hesitant, respectively (83, 48.3%, 80, 67.8%, 3, 5.6%; p<0.001, χ^2= 69,548, respectively). According to the expression of the vaccine-hesitant participants, the most prevalent reasons for vaccine hesitancy were the side effects (23, 42.6%) and lack of trust in pharmaceutical companies (21, 38.9%).

Table 2: Vaccination behavior and vaccination history for influenza vaccinations (n=172)

Variables	Total N (%)	Non-Vaccine Hesitant N (%)	Vaccine Hesitant N (%)	P-value
Observations	**172 (100)**	**118 (68.6%)**	**54 (30.4)**	NA
Vaccinated for influenza within the last 2 years				P<0.001*; χ^2= 43,906
Vaccinated	80 (46.5)	75 (63.6)	5 (9.3)	
Non-Vaccinated	92 (53.5)	43 (36.4)	49 (90.7)	
Reasons for non-vaccination				P<0.001*; χ^2= 18,901
Side effects	73 (57.9)	30 (41.7)	43 (79.6)	
Price	22 (17.5)	16 (22.2)	6 (11.1)	
Miscellaneous	31 (24.6)	26 (36.1)	5 (9.3)	
Willingness to be vaccinated against influenza				P<0.001*; χ^2= 69,548
Yes	83 (48.3)	80 (67.8)	3 (5.6)	
Unsure	30 (17.4)	20 (16.9)	10 (18.5)	
No	59 (34.3)	18 (15.3)	41 (75.9)	
Reasons for vaccine hesitancy				NA
Side effects			23 (42.6)	
Autism spectrum disorder			7 (13.0)	
No reason. Just hesitant			3 (5.6)	
Trust issues to pharmaceutical companies			21 (38.9)	

* Chi-Square test,

Knowledge level about influenza and influenza vaccination

The Knowledge level of influenza and influenza vaccination of the participants is given in Table 3. According to the obtained results, the good knowledge level about influenza (Flu) of the participants for total, non-vaccine hesitant, and vaccine-hesitant (133, 77.3%, 94, 79.7%, 39,72.2%; p>0.05) respectively. There is a statistically significant difference among the knowledge level about the influenza vaccines (76, 44.2%, 55, 46.6%, 21, 38.9%; p<0.001, χ^2= 20,482, respectively). The participant's knowledge level about the side effects was statistically different between the non-vaccine hesitant and vaccine-hesitant groups (p<0.001, χ^2= 14,718).

Information sources and the reliability of information about influenza and influenza vaccination

Table 4 presents the obtained results about the information sources and the participant's beliefs about the information sources' reliability. According to our results, more than half (76.2%) of the non-vaccine hesitant group had information from either a physician or a pharmacist (47, 39.8%, 43, 36.4%, respectively). On the other hand, the vaccine-hesitant group usually gathered information through TV, the Internet, or a relative and friends (23, 42.6%, 9 16.7%). The number of vaccine-hesitant participants who had been informed through non-reliable information sources compared to the physician and pharmacist was 34 (59.3%), and the majority of the vaccine-hesitant groups trusted the information they gathered through a non-reliable source. A statistically significant difference (p<0.001, χ^2= 22.804) has been calculated for the information sources among the groups.

Table 3: Knowledge level about the influenza and influenza vaccination (n=172)

Variables	Total N (%)	Non-Vaccine Hesitant N (%)	Vaccine Hesitant N (%)	P-value
Observations	**172 (100)**	**118 (68.6%)**	**54 (30.4)**	**NA**
Knowledge level about influenza (Flu)				> 0.05*
Good	133 (77.3)	94 (79.7)	39 (72.2)	
Fair	34 (19.8)	21 (17.8)	13 (24.1)	
Poor	5 (2.9)	3 (2.5)	2 (3.7)	
Knowledge level about influenza (Flu) vaccines				P <0.001*; χ^2= 20.482
Good	76 (44.2)	55 (46.6)	21 (38.9)	
Fair	80 (46.5)	60 (50.8)	20 (37.0)	
Poor	16 (9.3)	3 (2.5)	13 (24.1)	
Knowledge level about side effects of influenza (Flu) vaccines				P <0.001*; χ^2=14.718
Good	44 (25.6)	20 (16.9)	24 (44.4)	
Fair	106 (61.6)	81 (68.6)	25 (46.3)	
Poor	22 (12.8)	17 (14.4)	5 (9.3)	
Side effects of influenza (Flu) vaccines				P <0.001*; χ^2= 37.178
Fever	68 (40.2)	57 (49.6)	11 (20.4)	
Allergic reactions	38 (22.5)	16 (13.9)	22 (40.7)	
Headache	32 (18.9)	25 (21.7)	7 (13.0)	
Autism spectrum disorder	10 (5.9)	1 (0.9)	9 (16.7)	
Miscellaneous	21 (12.4)	16 (13.9)	5 (9.3)	

*Chi-Square test

Table 4: Information sources and the reliability of information about influenza and influenza vaccination (n=172)

Variables	Total N (%)	Non-Vaccine Hesitant N (%)	Vaccine Hesitant N (%)	P-value
Observations	**172 (100)**	**118 (68.6%)**	**54 (30.4)**	**NA**
Source of knowledge about influenza (Flu) vaccines				P<0.001* ; χ^2= 22,804
Physician	63 (36.6)	47 (39.8)	16 (29.6)	
Pharmacist	49 (28.5)	43 (36.4)	6 (11.1)	
TV, Internet, social media	43 (25.0)	20 (16.9)	23 (42.6)	
Relatives and friends	17 (9.9)	8 (6.8)	9 (16.7)	
Trusting the gathered knowledge about influenza (Flu) vaccines				P >0.05*
Yes	124 (72.1)	90 (76.3)	34 (63.0)	
Unsure	39 (22.7)	23 (19.5)	16 (29.6)	
No	9 (5.2)	5 (4.2)	4 (7.4)	

*Chi-Square test

Discussion

Our study employed a cross-sectional approach to investigate the influence of determinants for vaccine hesitancy within the Turkish population. Within the results obtained, we explored vaccination behaviors, vaccine knowledge levels, and the origins of vaccine-related information among participants. Notably, our study revealed that a substantial portion, precisely one in three participants, held anti-vaccine viewpoints. Based on our findings, among the determinants contributing to opposition to vaccine hesitancy include levels of knowledge, educational level, age, and knowledge level about influenza and influenza vaccines. According to the technical report from the ECDC regarding seasonal influenza coverage rates [29], Hungary displayed a vaccination rate of 21.9% among individuals aged above 60 years during the 2017/2018 period, falling considerably short of the target of 75%. In another Hungarian study focused solely on active adults, the observed influenza vaccination uptake was notably low at 12.3% [30]. Comparable numbers were observed in Poland, where overall influenza vaccination coverage was reported at 9.5% within the general population, reflecting suboptimal influenza vaccination uptake throughout Europe [31]. Among the participants in the study, over half (944 out of 1631) possessed occupational and/or health risk factors, with a mere 15.4% having received influenza vaccination. Recent research has indicated that vaccination percentages within the demographic of adults aged 16 to 65 with underlying risk factors were comparatively elevated, ranging from 29.8% to 49.2% in Australia and 45.7% to 49.4% in England [32,33]. According to the literature, the vaccination rate of the Turkish population fluctuates between %5.9 and 27.3% [34–36]. The vaccine uptake in our study was 46.5%, which is not entirely consistent with the literature. The vaccination uptake results in Europe, especially in Eastern Europe, are lower than the results we obtained. The characteristics of the participants could explain this inconsistency. The majority of the participants were elderly. Also, our study was held during the COVID-19 pandemic, which could lead participants to have an influenza vaccine in addition to the COVID-19 vaccine. Another critical factor is that the Turkish Ministry of Health reimbursed the cost of influenza and pneumococcal vaccines for special population groups (elderly, pregnant women, children, patients with COPD, etc.). Another study finding is that participants with higher education backgrounds were more hesitant about influenza vaccines. According to Schmid et al., pandemic influenza vaccine hesitancy predominantly correlated with sociodemographic factors (such as age, gender, education, and additional risk factors) and past behavior [2].In their finding, the primary obstacles identified for pandemic influenza vaccine acceptance among the general population were complacency (reduced concern about the disease, diminished perception of disease risk and severity, and lowered susceptibility to contracting the disease) and lack of confidence (diminished trust in authorities, decreased belief in vaccine efficacy, reduced perceived subjective norm, heightened concerns about vaccine safety, and increased unfavorable attitudes towards the vaccine) [2]. According to many studies, it has been observed that the level of knowledge about influenza is associated with vaccine hesitancy [2,19,30,37]. Studies have revealed a positive correlation between increasing knowledge levels and vaccination. On the other hand, there are studies in which the lack of information about influenza feeds the opposition to vaccination. A similar result is also observed in our study. The participant's level of knowledge about the disease and their opinions about side effects are consistent with the literature. In addition, it was observed that anti-vaccine individuals preferred less reliable sources of information, such as the Internet, television, and friends, instead of reliable sources of information, such as doctors and pharmacists.

According to systematic reviews, problems related to vaccine safety are among the crucial reasons for vaccine hesitancy. Severe or mild side effects may cause individuals to change their opinions about vaccine hesitancy [2,4,38]. In our study, similar to the literature, the presence of opposition to vaccination due to mild or severe side effects is observed.

Pharmacists, the closest health workers to the community, need to inform and follow up with individuals about influenza disease, complications, vaccines, and side effects. In pharmacist-managed vaccination programs, it is seen that health outcomes are improved, costs are reduced, and workday loss is prevented [26,39,40]. There were certain limitations exist in this study. Firstly, the research encompassed a relatively modest participant pool; caution should be warranted when generalizing the findings due to the predominant representation of the elderly with higher in our sample. This skew could be attributed to accessibility challenges associated with online surveys, as individuals with lower educational backgrounds are less inclined to utilize the Internet. Thus, some subgroups might be underrepresented in online survey platforms.

Consequently, future investigations should elicit insights from underrepresented demographics to ensure a more comprehensive understanding of their perspectives and behaviors. Additionally, it is worth noting that this study was conducted during the fall-winter seasons, limiting its ability to gauge potential seasonal variations in vaccination behaviors. Given the reliance on self-reported data, personal opinions may have influenced responses. The nature of the questionnaires induced a reluctance to admit to inaccurate beliefs; however, emphasizing the confidentiality of participants' identities and responses mitigated this potential bias. Furthermore, the study's focus on the preceding three months before the interview might have accentuated the impact of recall bias.

Conclusion

According to the studies available in the literature and the data we have obtained, there is no room for pessimism in the fight against anti-vaccination. Approaching the problems as a team of healthcare professionals, increasing the level of health literacy of society, conducting side effect profiles, and combating side effects under the leadership of pharmacists will be enough to overcome the problems caused by vaccine opposition. Pharmacists' delivery of cognitive pharmacy services such as patient education and counseling and pharmaceutical care services to patients and the community make tremendous contributions to the fight against many diseases well as influenza. More comprehensive studies are needed to develop and diversify pharmacists' services on anti-vaccination.

Abbreviation

WHO: World Health Organization; FIP: International Federation of Pharmacists; IQR: Interquartile Range; SPSS: Statistical Package for Social Science; COVID-19: Coronavirus Disease 2019; COPD: Chronic Obstructive Pulmonary Disease

Declaration

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Availability of data and materials

Data will be available by emailing yunusbektay@gmail.com

Authors' contributions

Muhammed Yunus Bektay (MYB) participated in the investigation, conceptualization, methodology, resources, supervision, validation, writing, reviewing, and editing. Mehmet Halit Ulaş (MHU) participated in the investigation, conceptualization, Writing, review, data collection, and editing. All authors have read and agreed to the published version of the manuscript. All authors have read the final manuscript.

Ethics approval and consent to participate

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013). The protocol was approved by the Bezmialem Vakif University local Ethics Committee with decision number 18/347 in 2020. An electronically signed informed consent was obtained from all individual participants included in the study. All procedures performed in the study were in accordance with the ethical standards of the University of Siena and with the 1964 Helsinki Declaration and its later amendments.

Consent for publication

Not applicable

Competing interest

The authors declare that they have no competing interests.

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Author Details

[1]Department of Clinical Pharmacy, Faculty of Pharmacy, Bezmialem Vakif University, 34093, Istanbul, Turkey, ORCID: 0000-0003-2032-9957.

[2]Faculty of Pharmacy, Bezmialem Vakif University, 34093, Istanbul, Turkey

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