



Prevalence of Polypharmacy among Elderlies Who Attends the Primary Health Care Centers in Medina, Saudi Arabia

Ahmed Dhaifallah Hamad Alharbi ^{a*#} and Alhanouf Dhaifallah Hamad Alharbi ^{b≡}

^a *Ministry of Health, Medina, Saudi Arabia.*

^b *Taibah University, Medina, Saudi Arabia.*

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JPRI/2022/v34i30B36076

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/85921>

Original Research Article

Received 02 February 2022

Accepted 12 April 2022

Published 12 April 2022

ABSTRACT

The rising incidence of non-communicable diseases is one of the greatest concerns confronting health systems worldwide in the twenty-first century. The elderly population's high prevalence of non-communicable diseases has increased drug prescriptions. Consequently, polypharmacy, or numerous drugs, has become prevalent. This study aimed to estimate the prevalence of polypharmacy among the elderly population in Madinah, Saudi Arabia, who attends primary health care centers. A cross-sectional study was done on 400 participants. 60% of participants were 55-70 years old. 23.7% of elderly participants were with minor polypharmacy, 34.7% of elderly participants were with moderate polypharmacy, and 32.7% of elderly participants were with major polypharmacy as they had more than five medicines at the same time. This study revealed that most participants suffer from chronic health conditions and use high-dose medicines daily. In conclusion, the Saudi Arabia government and the welfare organizations of the Al-Madinah Al-Munawarah must arrange seminars and campaigns to raise awareness about the dependency on medicines and limit the negative effects of polypharmacy among this special group.

Keywords: *Polypharmacy; elderly; Saudi Arabia; non-communicable diseases; drugs.*

[#] *Family Medicine Resident,*

[≡] *Medical Intern,*

^{*} *Corresponding author: E-mail: Drahmaddeef@gmail.com;*

1. INTRODUCTION

The rising incidence of non-communicable diseases (NCD) is one of the greatest concerns confronting health systems worldwide in the twenty-first century [1]. The elderly population's high prevalence of NCDs has increased drug prescriptions [2,3,4]. Consequently, Polypharmacy (PP), or the use of numerous drugs, has become prevalent.

Polypharmacy is the name for taking several drugs, defined as taking five or more prescription medications. [5,6,7]. This PP is required in some situations; this is associated with serious other adverse outcomes [6]. Based on the United Nations defines a senior as a person 60 years or older [8]. Elderlies are more susceptible to getting multiple NCDs than the younger population; this leads to an increase in the prevalence of PP among this specific group of age. Multiple risk factors are associated with PP, such as more side effects, drug-drug interactions, non-adherence to the prescribed medications and instructions, financial costs, and morbidity outcomes.

Saudi Arabia has a significant elderly population with several NCDs, necessitating more care and consistent monitoring of their medications to improve life expectancy. In Saudi Arabia, life expectancy increased from 64.4 years in the 1980s to 74.3 years in the 2000s (World Bank, 2014) [9.] Consequently, by 2035, the proportion of older adults is predicted to rise to 18.4 per cent [10]. Also, according to the findings of another research, older adults with many impairments are more susceptible to the danger of polypharmacy. The average number of diseases in this population was 7.7. The average number of medications absorbed was 4.9, with the number of medications absorbed and the prevalence of PP being 5.2 (51%) in hypertension, 5.6 (58%) in hyperlipidemia, 5.8 (61%) in myocardial infarction, 5.6 (54%) in diabetes, 5.1 (52%) in dementia, and 7 (73%) in depression, respectively [11].

Riyadh is a city in Saudi Arabia. A total of 3009 patient profiles were examined, with the average age of the patients being 73.26 6.6 years. It was revealed that 55% of the patients have PP. Patients aged 65 to 70 years were given an average of 6.4 drugs, with a massive difference for patients aged 71 years and above. In contrast, a linear link between age and comorbidities illnesses associated with older patients was discovered. The most prevalent

comorbidity illnesses in the elderly aged 65 and older are hypertension, hyperlipidemia, and diabetes mellitus [12]. Another research of 766 individuals revealed an increase in the number of patients with PP among medical outpatients at a tertiary care institution [13].

PP prevalence was 21.1 percent in previous research done on a primary health care facility in Riyadh, Saudi Arabia, as characterized by the usage of four or more drugs [14,15]. According to other cross-sectional research, this level was 39.4 in Italy, 32.5 in Taiwan,[16] and 29.5 in New Zealand. [17] Furthermore, another research in Italy found that polypharmacy was prevalent in 46 percent of the elderly aged 65 and above. [18] Blozik et al. revealed that polypharmacy (17%) and the use of potentially unsuitable drugs (21%) were common among the elderly in Switzerland, with effects including hospitalization and impaired performance and mortality [19].

The increased frequency of polypharmacy in most other research might be because seniority was measured in years above 65. On the other hand, the prevalence of PP has grown in recent decades, particularly among the elderly. This increment hurts the elderly's health, quality of life, hospitalization, comorbidities and mortality rate [20-23]. Understanding the relation between PP and health outcomes should be a priority to optimize the treatment for geriatrics because there is no previous comprehensive study that provides the prevalence of pp for this specific group of age which proved to be vulnerable, in the Madinah region [24-27]. This research primarily aims to determine the prevalence and potential factors associated with polypharmacy among the elderly population in Madinah, Saudi Arabia, who attends primary health care centers.

2. METHODS

An observational cross-sectional study was done to explore the prevalence of polypharmacy usage among all male and female patients aged over 60 years who attend primary health care (PHC) clinics from January 2021 to January 2022 in Madinah, Saudi Arabia.

Inclusion included patients above 60 years who were taken multiple medications with multi-comorbidities. Non-co-operative patients, mentally ill Patients, Patients with dementia will be excluded.

2.1 Sample Size and Sample Technique

Four hundred participants were collected by non-probability purposive sampling method. Those

participants were recruited from primary health care centers by stratified random sampling technique. Al-Madinah Al-Munawara area will be divided into 4 different regions: east, west, north, and south. After the stratified sampling, a random sampling technique will be used to choose two Ministry of Health (MOH) primary health care centers from each region. So, we will have eight MOH primary health care centers from four regions.

By using the means of the prevalence in the previously mentioned Saudi studies, which is 55%, the sample size of this study was calculated as equal to 381 participants. The CI of this study is 95%, while the precision is 5%. The following formula was used to determine the exact number of sample participants.

$$(n) = Z^2 \times P(1-P) / d^2$$

Four hundred participants were recruited instead of 381 from the 8 MOH primary health care centers from 4 regions to maintain accuracy and precision. So, 50 participants will be recruited from each centre. $50 \times 8 = 400$

2.2 Data Collection Tool

To collect the data, a validated and structured questionnaire was used. The questionnaire comprised four sections; The first section was about demographic characteristics such as gender, age, education, history of previous diseases and others). the second section consisted of the prevalence of polypharmacy. The degree of pharmacy was determined by giving four options no use of polypharmacy (less than 2 medicine), minor polypharmacy (2-3 medicines), moderate polypharmacy (4-5 medicines) and major polypharmacy (More than Polypharmacy). The third section is composed of the utilization of medicines. And the last section discussed the attitude of the elderly toward medicines.

2.3 Data Entry and Analysis

All data were collected from the online survey, coded and verified before data entry. Data entry and statistical analysis were carried out with SPSS software (version 24). Statistical significance will be determined using the significance difference, either equal to or smaller than 0.05. Descriptive statistics were presented, including frequency, mean, median, standard deviation, P-value, and the percentage age of respondents. In addition, tests of significance such as the Chi-test & independent sample t-test

were applied. The chi-square test was used to test the relation between (age, occupation, marital status, educational level, and anxiety level).

3. RESULTS

This study revealed that 60% of participants were 55-70 years old. At the same time, 33% of participants were more than 70 years of age. Only 7% of elderly participants were between 40-55 years old age. Table 1 describes the details of demographic characteristics. Regarding gender, it was revealed that 60.9% of elderly participants were male, and 39.1% were female. 76.2% of elderly participants were Saudi, while 95% were Non-Saudi. In the shadow of the nature of the job, 26.2% of elderly participants were retired, 9.2% were soldiers, 6% were in civil and private sectors, while most of the elderly participants were doing nothing now (42.7%). Chronic health problems greatly affect the number of medications, so it was concluded that 39.5% of participants have 4 chronic health issues, 10.7% have 5 health issues, 8.2% of elderly participants have more than 5 chronic health issues, and only 0.5% of elderly patients are without any chronic health issue. Education also varied from person to person because 30% of elderly participants were uneducated. 22% passed primary education, 7.7% passed intermediate, 13.7% completed secondary education, 15.2% completed universal degree, while only 10% of elderly participants did post-graduate. Income level influences a lot of diseases and results in medicine prescription, so it was found that 49% of elderly participants do not have enough income, 14.7% have enough sources of income. In comparison, 36.3% of elderly participants preferred not to declare their income. Social status also influences diseases and medicines, so it was found that 82% were married, 6% were unmarried, 5.5% were divorced, and only 6.5% were widows. 81.7% of participants had comorbidity while 18.3% did not have.

Table 2 describes the analysis of the demographic characteristics of the elderly participants. It was found that the mean ages us 3.48, gender 1.79, nationality 1.33, nature of job 5.21, chronic health problems 1.58, income level 1.63, social status 1.84, comorbidity and 2.28. Further significance values, standard deviation, P-value and CI95% are given to demonstrate the correlation among different variables of a factor.

Table 3 gives the baseline characteristics by the degree of polypharmacy. In which 4 degrees of

polypharmacy of given. No polypharmacy is with less than 2 medicines. Minor polypharmacy is with 2-3 medicines, moderate polypharmacy is with 4-5 medicines, and major polypharmacy is with more than 5 medicines. Results showed that 9.5% of elderly participants had no polypharmacy because they had less than 2 medicines. 23.7%

of elderly participants had minor polypharmacy because they had 2-3 medicines. 34.7% of elderly participants had moderate polypharmacy because they had 3-5 medicines. 32.7% of elderly participants were with major polypharmacy.

Table 1. Demographic characteristics of participants

Characteristics	Total number (400)	Percentage
Age		
40-55 (Late Young)	28	7%
60-74 (Young Old)	76	19%
75-89 (Old)	55	13.8%
90-99 (Very Old)	189	47.2%
100+ (Centenarians)	52	13%
Gender		
Male	157	39.1%
Female	243	60.9%
Nationality		
Saudi	305	76.2%
Non-Saudi	95	23.8%
Nature of job		
Retired	105	26.2%
Civil	24	6%
Soldier	37	9.2%
Private sector	25	6.2%
does not work	171	42.7%
Other	38	9.7%
Chronic health problems		
0	2	0.5%
1	19	4.7%
2	48	12%
3	97	24.2%
4	158	39.5%
5	43	10.7%
More than 5	33	8.2%
Level of education		
Uneducated	120	30%
Primary	90	22.5%
Intermediate	31	7.7%
Secondary	55	13.7%
Universal	61	15.2%
Post-graduate	43	10.7%
Income level		
Enough	196	49%
Not enough	59	14.7%
preferred not to declare	145	36.3%
Social status		
Married	328	82%
Unmarried	24	6%
Divorced	22	5.5%
Widow	26	6.5%
Co-morbidity		
Yes	327	81.7%
No	73	18.3%

Table 2. Analysis of demographic characteristics of participants among different variables of a factor

Characteristics	Mean	Sig.	St deviation	P-value	CI 95%
Age					
40-55	3.48	0.04	1.36	0.86	(1.76-2.37)
60-74		0.03		0.56	(1.58-4.87)
75-89		0.27		0.36	(3.38-5.27)
90-99		0.36		0.29	(1.66-3.97)
100+		0.28		0.62	(1.59-5.38)
Gender					
Male	1.79	0.03	0.41	0.267	(1.27-6.23)
Female		0.04		0.47	(1.25-3.61)
Nationality					
Saudi	1.33	0.07	1.69	0.58	(2.97-3.61)
Non-Saudi		0.11		0.65	(2.59-3.91)
Nature of job					
Retired	5.21	0.07	2.49	0.59	(2.15-3.81)
Civil		0.16		0.37	(2.59-3.21)
Soldier		0.09		0.97	(1.88-4.21)
Private sector		0.07		0.478	(3.37-4.29)
does not work		0.18		0.47	(2.07-4.49)
Other		0.00		0.37	(3.37-4.49)
Number of Chronic health Diseases					
0	1.58	0.07	0.69	0.39	(1.07-4.99)
1		0.07		0.58	(3.97-4.39)
2		0.07		0.58	(2.97-4.49)
3		0.08		0.57	(1.69-4.89)
4		0.07		0.72	(0.97-5.89)
More than 5		0.08		1.47	(1.61-5.59)
Income level					
Enough	1.63	0.03	0.38	1.58	(3.58-5.53)
Not enough		0.07		0.58	(0.58-5.93)
preferred not to declare		0.06		0.47	(2.18-5.13)
Social status					
Married		0.04	1.20	0.58	(2.20-5.53)
Unmarried	1.84	0.00		0.47	(2.69-5.33)
Divorced		0.08		1.48	(2.61-5.13)
Widow		0.07		0.70	(2.89-5.03)
Co-morbidity					
Yes	2.28	0.06	1.92	0.26	(1.89-5.43)
No		0.04		1.58	(1.28-5.53)

Table 3. Baseline characteristics by the degree of polypharmacy

Degree of Polypharmacy	Prescribed medicines	No elderly patients	% of elderly patients
No polypharmacy	Less than 2 medicines	38	9.5%
Minor polypharmacy	2-3 medicines	95	23.7%
Moderate polypharmacy	4-5 medicines	139	34.7%
Major Polypharmacy	More than 5 medicines	128	32.7%

Table 4. Attitude of elderly towards medicines

Attributes	Strongly agree	Agree	Unsure	Strongly disagree	Disagree
Regular medicines are necessary to treat chronic diseases	58	38	128	144	32
Medicines help to balance blood pressure and sugar	42	136	52	160	10
Medicines taking is not a difficult task	138	49	84	59	70
You don't feel any side-effect to take it	185	39	49	73	54
Medicines are life-saving things	44	159	78	58	61
Medicines aid to increase the lifespan	136	146	69	35	14
You take the medicines regularly by will	138	184	48	27	3
You take the medicines daily by forcefully	24	50	42	126	158
You don't feel comfortable taking medicines	11	20	16	167	189
You don't think that medicines can increase your lifespan	32	49	22	169	128

Table 4 indicates the attitudes of elderly participants toward medicines. It was found that most of the participants (144) strongly disagreed with admitting that regular medicines are necessary to treat chronic diseases. In addition, 160 elderly participants strongly disagree to admit that medicines can help balance the body's blood pressure and glucose level. At the same time, 138 participants agreed that medicine taking is not a difficult task. One hundred eighty-five elderly participants agreed that these medicines do not have any side effects. While 159, a majority of the participants strongly agreed that these medicines are helpful to increase their lifespan. One hundred forty-six participants strongly agreed, while 136 agreed that medicines could increase their lifespan by treating life-threatening conditions. One hundred thirty-eight participants agreed that they take their medicine by will. In comparison, only 20 participants agreed that they take medicine forcefully under the pressure of doctors, family, etc. 189 participants feel comfortable taking medicines. Moreover, 32 elderly participants agreed that these medicines could not increase their lifespan, while most (128) disagreed with that statement.

4. DISCUSSION

This study revealed that most participants suffer from chronic health conditions and use high dose medicines per day. This result was cleared in

another study done in Qatar, which revealed that the prevalence of PP among Qatari elderly persons who visit PHC Centers is quite high, with females 1.18 times more likely than men (95 % CI: 1.03–1.34) [10]. The prevalence of polypharmacy is high in the elderly due to various risk factors. Nevertheless, the attitude of the participants towards medicines is highly positive. However, these medicines have side effects on their health and increase the economic burden due to expensive medicines. In recent research of 3009 older persons in Saudi Arabia, it was shown that 55 percent of them had been exposed to polypharmacy [28]. In addition, research in Kuwait found that over 60% of elderly persons had Polypharmacy [29].

Furthermore, research in Italy found that 40 percent of a nationwide sample of older people had polypharmacy [10], while a study in Sweden found that 44.0 percent had polypharmacy [17]. In another research conducted in the United States [19]. Similarly, Brazilian research of 1705 older people found that 32 percent had been subjected to polypharmacy [11]. On the other hand, some studies found a greater rate of polypharmacy. In population-based research in Korea, for example, 86.4 percent of elderly patients were found to have polypharmacy [18]. In addition, according to research published in Oman in 2016, 76.3 percent of elderly patients released from a tertiary hospital were exposed to polypharmacy [30]. However, comparable results

in Oman might be explained by the increased quantity of drugs provided for these patients' severe diseases. The high frequency of PP identified in our research might be explained by the fact that patients at PHC facilities are seen and treated by several doctors, leading to the authorization of other drugs at different visits.

Kann et al. found that the number of practitioners had a substantial impact on the probability of PP in patients (OR: 2.32; 95 percent CI: 2.31–2.33) [30]. The high frequency of NCDs in a Qatari research population is another element that might explain such a situation. In addition, Canadian researchers found a link between Polypharmacy and a greater frequency of family physician visits in senior individuals [31]. Finally, providing free drugs to all Qatari people may make it simple and available.

The Saudi Arabia government and the welfare organizations of the Al-Madinah Al-Munawarah must arrange seminars, workshops, and campaigns for the elderly patients to live a healthy life by adopting a healthy lifestyle such as proper diet, exercise, physical activities and yoga etc [32-35]. These activities will make them feel relaxed and decrease the economic burden on the elderly. In addition, the campaigns will spread awareness about the dependency on medicines are how these medicines can affect the elderly participants day by day [36-38].

5. CONCLUSION

This study revealed that most participants suffer from chronic health conditions and use high dose medicines per day. The prevalence of polypharmacy is high in the elderly due to various risk factors. Nevertheless, the attitude of the participants towards medicines is highly positive. However, these medicines have side effects on their health and increase the economic burden due to expensive medicines. Saudi Arabia's government and the welfare organizations of the Al-Madinah Al-Munawarah must arrange seminars, workshops, and campaigns for the elderly patients to live a healthy life by adopting a healthy lifestyle such as proper diet, exercise, physical activities and yoga etc. These activities will make them feel relaxed and decrease the economic burden on the elderly. In addition, the campaigns will spread awareness about the dependency on medicines are how these medicines can affect the elderly participants day by day.

CONSENT AND ETHICAL APPROVAL

Each Patient will be informed face to face about the importance and the usefulness of the study. A consent form was obtained from each participant and explained individually to the participant himself and the watcher. The local, regional research ethics committee provided the institutional ethical certificate, Medina Province. There are no invasive or harmful procedures or blood draws. The study is self-funded with no conflict of interest.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Cusack B. Pharmacokinetics in older persons. *Am J Geriatr Pharmacother*. 2004;2(4):274–302. DOI:10.1016/j.amjopharm.2004.12.005
2. Weng M, Tsai C, Sheu K, Lee Y, Lee H, Tzeng S et al. The impact of number of drugs prescribed on the risk of potentially inappropriate medication among outpatient older adults with chronic diseases. *Q J Med*. 2013;106(11):1009–15.
3. Wynne H, Blagburn J. Drug treatment in an ageing population: Practical implications. *Maturitas*. 2010;66(3):246–50. DOI:10.1016/j.maturitas.2010.03.004
4. Maher R, Hanlon J, Hajjar E. Clinical consequences of polypharmacy in elderly. *Expert Opin Drug Saf*. 2013;13(1):57–65. DOI:10.1517/14740338.2013.827660
5. Alshahrani NZ, Alhashim LA, Almohaishi HA. FIFA World cup 2022 in Qatar; health advice and safety issues for travelling Attendees. *Ann Med Health Sci Res*. 2021;11:417–22.
6. Frazier S. Health Outcomes and Polypharmacy in Elderly Individuals: an integrated literature review. *J Gerontol Nurs*. 2005;31(9):4–9. DOI:10.3928/0098-9134-20050901-04]
7. Fried T, Ox'Leary J, Towle V, Goldstein M, Trentalange M, Martin D. Health Outcomes Associated with Polypharmacy in Community-Dwelling Older Adults: A Systematic Review. *J Am Geriatr Soc*. 2014;62(12):2261–72.

- DOI:10.1111/jgs.13153
8. Rochon P, Gurwitz J. Optimizing drug treatment for elderly people: the prescribing cascade. *BMJ*. 1997; 315(7115):1096–99.
DOI:10.1136/bmj.315.7115.1096
 9. Gomez C, Vega-Quiroga S, Bermejo-Pareja F, Medrano M, Louis E, Benito-Leon J. Polypharmacy in the Elderly: A Marker of Increased Risk of Mortality in a Population-Based Prospective Study (NEDICES). *Gerontology*. 2014;61(4):301–9. 10.
 10. Slabaugh S, Maio V, Templin M, Abouzaid S. Prevalence and Risk of Polypharmacy among the Elderly in an Outpatient Setting. *Drugs Aging*. 2010;27(12):1019–28.
DOI:10.2165/11584990-000000000-00000
 11. Alshahrani, Amal, et al. "WhatsApp-based intervention for promoting physical activity among female college students, Saudi Arabia: a randomized controlled trial. *Eastern Mediterranean Health Journal*. 2021;27:8.
 12. Carmona-Torres J, Cobo-Cuenca A, Recio-Andrade B, Laredo-Aguilera J, Martins M, Rodríguez-Borrego M. Prevalence and factors associated with polypharmacy in the older people: 2006–2014. *J Clin Nurs*. 2018;27(15–16):2942–52.
DOI:10.1111/jocn.14371
 13. Jyrkkä J, Enlund H, Korhonen M, Sulkava R, Hartikainen S. Patterns of Drug Use and Factors Associated with Polypharmacy and Excessive Polypharmacy in Elderly Persons. *Drugs Aging*. 2009;26(6):493–503.
DOI:10.2165/00002512-200926060-00006
 14. Alhashim LA, Alshahrani NZ, Alshahrani AM, Khalil SN, Alrubayii MA, Alateeq SK, Zakaria OM. Food Safety Knowledge and Attitudes: A Cross-Sectional Study among Saudi Consumers from Food Trucks Owned by Productive Families. *International Journal of Environmental Research and Public Health*. 2022;19(7):4322.
Available:https://doi.org/10.3390/ijerph19074322
 15. Alkhormi, Abdulrahman H., Najim Z. Alshahrani, and Syed Esam Mahmood. Khat chewing leads to increase in glycaemic parameters in patients with type 2 diabetes mellitus in Jazan region, Saudi Arabia and Yemen. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*. 2021;15(2):565-568.
 16. Ramos L, Tavares N, Bertoldi A, Farias M, Oliveira M, Luiza V. Polypharmacy and Polymorbidity in Older Adults in Brazil: a public health challenge. *Rev Saude Publica*. 2016;50 (suppl 2).
 17. Alshahrani, Najim Z, Hassan A. Almohaishi, and Marwa Alabadi. Preventive measures to mitigate transmission of Covid-19 on aircrafts. *Int J Med Rev Case Rep*. 2021;5:93-95.
 18. Kim H, Shin J, Kim M, Park B. Prevalence and Predictors of Polypharmacy among Korean Elderly. *PLoS ONE*. 2014;9(6): e98043
DOI:10.1371/journal.pone.0098043
 19. Charlesworth C, Smit E, Lee D, Alramadhan F, Odden M. Polypharmacy Among Adults Aged 65 Years and Older in the United States: 1988–2010. *J Gerontol A Biol Sci Med Sci*. 2015; 70(8):989–95.
DOI:10.1093/gerona/glv013
 20. Masnoon N, Shakib S, Kalisch-Ellett L, Caughey G. What is Polypharmacy? A systematic review of definitions. *BMC Geriatr*. 2017;17(1).
 21. Alfahl S, Alharbi ADH, Alshahrani NZ. The Prevalence of Antenatal Depression among Women in Medina, Saudi Arabia”, *Journal of Pharmaceutical Research International*. 2021;33(60B):543-549.
DOI: 10.9734/jpri/2021/v33i60B34652.
 22. Ministry of Public Health. Healthy aging [Internet]. *Moph.gov.qa.*; 2018. [cited 18 March 2020].
Available:https://www.moph.gov.qa/english/strategies/National-Health-Strategy-2018-2022/Priority-Populations/Pages/Healthy-Aging.aspx
 23. Syed M, Alnuaimi A, Zainel A, A/Qotba H. Prevalence of non-communicable diseases by age, gender and nationality in publicly funded primary care settings in Qatar. *BMJ Nutrition, Prevention & Health*. 2019;2(1):20–29.
 24. Zidan A, Awisu A, El-Hajj M, Al-Abdulla S, Figueroa D, Kheir N. Medication-Related Burden among Patients with Chronic Disease Conditions: Perspectives of Patients Attending Noncommunicable Disease Clinics in a Primary Healthcare Setting in Qatar. *Pharmacy*. 2018; 6(3):85.
 25. Primary Health Care Corporation. Health centers [Internet]. *Primary Health Care Corporation*; 2018.

- [cited 10 March 2019]. Available: https://www.phcc.qa/portal_new/index/index.php?limit=home
26. Alshahrani AM, AlHalbub AYA, Althobaiti OO, Alshumrani SG, Alshumrani ZG, Alshahrani NZ, Alshumrani KG, AlGhamdi B, Al Modeer SMM, Alsudairy O, Alharbi ADH, Alshehri M, Alqahtani, AA, Hanash AA, Alshammari NS. Trends of Seasonal Influenza Incidence among the Population of Abha, Saudi Arabia During 2019, *Journal of Pharmaceutical Research International*. 2021;33(60B):1311-1317. DOI: 10.9734/jpri/2021/v33i60B34749.
 27. Alsuwaidan A, Almedlej N, Alsabti S, Daftardar O, Al Deaji F, Al Amri A et al. A Comprehensive Overview of Polypharmacy in Elderly Patients in Saudi Arabia. *Geriatrics*. 2019;4(2):36.
 28. Badawy N, Labeeb S, Alsamdan M, Alazemi B. Prevalence and Risk of Polypharmacy among Community-Dwelling, Elderly Kuwaiti Patients. *Medical Principles and Practice*. 2019;29(2):166–173. DOI:10.1159/000503298
 29. Al-Hashar A, Al Sinawi H, Al Mahrizi A, Al-Hatrush M. Prevalence and Covariates of Polypharmacy in Elderly Patients on Discharge from a Tertiary Care Hospital in Oman. *Oman Med J*. 2016;31(6):421–25. DOI:10.5001/omj.2016.85
 30. Kann I, Lundqvist C, Lurås H. Polypharmacy Among the Elderly in a List-Patient System. *Drugs—Real World Outcomes*. 2015;2(3):193–198. DOI:10.1007/s40801-015-0036-3
 31. Hu T, Dattani N D, Cox K A, Au B, Xu L, Melady D, et al. Effect of comorbidities and medications on frequency of primary care visits among older patients. *Can Fam Physician*. 2017;63:45–50.
 32. Primary Health Care Corporation. Corporate Strategic Plan 2019–2023. A Healthier Future for Our Families. [Internet]. PHCC; 2019. [Cited 10 May 2020]. Available: https://phcc.qa/portal_new/admin/images/documents/2019/Corporate%20Strategic%20Plan%202019-2023%20English.pdf
 33. Alshahrani, NZ, Alshahrani, SM, Fussi N. Alsheef, MJ. “Should Travellers have Priorities for COVID 19 Vaccine?”, *Journal of Pharmaceutical Research International*, 32(47), pp. 38-40. doi: DOI:10.9734/jpri/2020/v32i4731111.
 34. World Health Organization. The Anatomical Therapeutic Chemical Classification System with Defined Daily Doses (ATC/DDD). Available: <http://www.who.int/classifications/atcddd/en/>. Accessed 14 August 2018.
 35. Salisbury C, Johnson C, Purdy S, Valderas JM, Montgomery A. Epidemiology and impact of multimorbidity in primary care: a retrospective cohort study. *Br J Gen Pract* 2011;582:e12–21. 10.3399/bjgp11X548929
 36. Hughes L, McMurdo M, Guthrie B. Guidelines for people not for diseases: the challenges of applying UK clinical guidelines to people with multimorbidity. *Age and Ageing*. 2012; 42(1):62–69. DOI:10.1093/ageing/afs100
 37. Fulton MM, Riley Allen E. Polypharmacy in the elderly: a literature review. *Journal of the American Academy of Nurse Practitioners*. 2005 Apr;17(4):123-32.
 38. Banerjee A, Mbamalu D, Ebrahimi S, Khan AA, Chan TF. The prevalence of polypharmacy in elderly attenders to an emergency department—a problem with a need for an effective solution. *International journal of emergency medicine*. 2011 Dec;4(1):1-3.

© 2022 Alharbi and Alharbi; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:
The peer review history for this paper can be accessed here:
<https://www.sdiarticle5.com/review-history/85921>