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Polypharmacy Prevalence in Rural-Living Older Adults: A Cross-Sectional Study

Kırsalda Yaşayan Yaşlılarda Polifarmasi Yaygınlığı: Kesitsel Bir Çalışma

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This study was prepared based on the findings of Elif Aslıhan Korkmaz's thesis study titled "Prevalence and associated factors of polypharmacy in the elderly living in a rural area" (Çanakkale: Çanakkale Onsekiz Mart University; 2022).

ABSTRACT Objective: This study aimed to determine the prevalence of polypharmacy and its associated factors in older adults living in rural areas. **Material and Methods:** This cross-sectional study included a total of 585 older adults aged ≥65 years living in a town in western Türkiye. Data were collected through face-to-face interviews at family health centers using a questionnaire prepared by the authors in line with the literature. The data collected for the research were analyzed using the SPSS for Windows 25.0. Descriptive statistical methods were used to evaluate data. In addition, a logistic regression analysis was performed to identify the influential factors in the presence of polypharmacy. The results were evaluated at a significance level of p<0.05. **Results:** The prevalence of polypharmacy was 24.1%. In addition, 51.6%, 52.1%, and 12.1% older adults used at least one over-the-counter drug, herbal medicines along with prescribed medications, and alternative treatment methods, respectively. However, older patients with four or more chronic diseases were exposed to polypharmacy approximately nine times (95% confidence interval 3.02-26.75) more than those with 1-3 chronic diseases. **Conclusion:** Approximately one-quarter of the older adults had polypharmacy, which was affected by multiple variables. The older adults should be evaluated for prescription and non-prescription drug use, and the rational drug use education should be provided.

Keywords: Geriatrics; cross-sectional studies; polypharmacy

ÖZET Amaç: Bu çalışma, kırsal kesimde yaşayan yaşlılarda polifarmasi prevalansını ve ilişkili faktörleri belirlemek amacıyla gerçekleştirildi. **Gereç ve Yöntemler:** Bu kesitsel çalışmaya Türkiye'nin batısında bir ilçede yaşayan 65 yaş ve üzeri toplam 585 yaşlı dâhil edildi. Veriler literatür doğrultusunda araştırmacılar tarafından hazırlanan anket formu aracılığı ile aile sağlığı merkezlerinde yüz yüze görüşme yöntemiyle toplandı. Araştırma için toplanan veriler, Windows 25.0 için SPSS kullanılarak analiz edildi. Verilerin değerlendirilmesinde tanımlayıcı istatistiksel yöntemler kullanıldı. Ayrıca polifarmasi varlığında etkili olan faktörleri belirlemek için lojistik regresyon analizi yapıldı. Sonuçlar p<0,05 anlamlılık düzeyinde değerlendirildi. **Bulgular:** Bu çalışmada, polifarmasi prevalansı %24,1 olarak belirlendi. Ayrıca yaşlıların reçeteli ilaçlarla birlikte sırasıyla %51,6, %52,1 ve %12,1'inin en az bir reçetesiz ilaç, bitkisel ilaç ve alternatif tedavi yöntemlerini kullandıkları görüldü. Bununla birlikte, 4 veya daha fazla kronik hastalığı olan yaşlıların, 1-3 kronik hastalığı olanlara göre yaklaşık 9 kat (%95 güven aralığı 3,02-26,75) daha fazla polifarmasiye maruz kaldığı belirlendi. **Sonuç:** Yaşlıların yaklaşık 1/4'ünde polifarmasi durumunun mevcut olduğu ve bazı değişkenlerin polifarmasi ile ilişkili olduğu görüldü. Bu bağlamda, yaşlıların reçeteli ve reçetesiz ilaç kullanımı açısından değerlendirilmesi ve akılcı ilaç kullanımı konusunda eğitilmesi önerilebilir.

Anahtar Kelimeler: Geriatri; kesitsel çalışma; polifarmasi

The older people population in the world continues to increase rapidly compared with other age groups. This leads to increased exposure to multiple chronic diseases and polypharmacy.[1] Although a universal definition of polypharmacy is difficult to postulate, in 46.4% of the articles included in a systematic review, the word "polypharmacy" was used to describe situations where patients consumed five or more drugs.[2] Although the so-called "appropriate polypharmacy" is not always the wrong strategy for patients with complex health problems, polypharmacy has been associated with many adverse health outcomes, including frailty, malnutrition, adverse drug events, depression, cognitive impair-

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ment, non-adherence to treatment, increased costs, falls, fractures, weight loss, prolonged hospitalization, disability, and mortality.[3,4]

Polypharmacy is a common geriatric health problem worldwide.[1] According to the World Health Organization 2019 data, more than half of the drugs used worldwide are prescribed or sold inappropriately, causing preventable harm.[5] In addition, a systematic review reported that the prevalence of polypharmacy varies between 7-45%.[6] According to a study conducted on a geriatric population of 6,104,798 people utilizing primary health care services in Türkiye, the rate of prescriptions containing five or more drugs four or more times a year was 14.3%. In the same study, patients receiving prescriptions containing five or more drugs in a month ranged from 16-20.7%.[7]

When the development of new drugs is associated with increased life expectancy, the incidence of polypharmacy is predicted to increase even further.[8] Healthcare professionals should be aware of this global public health problem and develop preventive strategies.[9] For older adults in rural areas, factors such as geographical barriers, location of health services, or problematic transportation may lead to changes in drug use patterns.[10] In addition, it is crucial to carry out studies that reveal the current status of drug overuse in the older adults to contribute to the rational drug use planning and thus, improvement. This study examined the prevalence of polypharmacy and its related factors among older adults living in rural areas in Türkiye.

MATERIAL AND METHODS

This cross-sectional study was carried out between March 25, 2021, and July 05, 2022 at Family Health Centers located in the Hayrabolu district and villages of Tekirdağ province in Türkiye. The research population consisted of 5,572 older adults living in the Hayrabolu district of Tekirdağ. The formula $n=Nt^2pq/(d^2(N-1)+t^2pq)$ was used to calculate the required sample size to estimate the proportion of a known population. The p and q values were taken as 0.5 because no previous studies have been conducted in this area. Additionally, a 99% confidence interval (CI) was considered. Consequently, 557 older adults were deemed necessary. Voluntary people aged ≥65 years who did not have speaking and comprehension problems in Turkish were included in the sample. The study included a total of 585 older adults individuals.

The study data were collected through a questionnaire between September 24, 2021 and December 16, 2021, at the family health centers. The study questionnaire was developed by the authors in line with the literature.[6,7,9,10] The questionnaire contained items on sociodemographic characteristics (age, sex, marital status, education, employment, tobacco and alcohol use, physical activity, sleep status, and life satisfaction) and questions on health (health perception, the presence and number of chronic diseases, history of falls, emergency admission, and hospitalization in the last year) and drug use (constantly used prescription and non-prescription drugs and alternative and complementary treatments) characteristics. Non-probabilistic purposeful sampling was used for the data collection. After explaining the research content, older adults who visited the family health centers and accepted the face-to-face interview were queried in a suitable environment. Each questionnaire took approximately 20 minutes to complete.

In this study, polypharmacy was the dependent variable. Consistent with the commonly used literature definition, the regular use of five or more drugs was accepted as polypharmacy. The frequency of polypharmacy was investigated by evaluating the total number of drugs used by the participants in the sample. The independent variables were age, sex, marital status, education, employment, tobacco and alcohol use, regular sleep, regular physical activity, life satisfaction, health perception, presence and number of chronic diseases, fall history in the last year, admission to emergency services, and hospitalization history. The data collected for the research were analyzed using the SPSS for Windows 25.0. (IBM Inc., Chicago, IL, USA). Descriptive statistical methods were used to evaluate data (frequencies and percentages). In addition, a logistic regression analysis was performed to identify the influential factors in the presence of polypharmacy. The results were evaluated at a significance level of $p<0.05$.

The study was conducted in line with the principles of the Declaration of Helsinki. This study was

approved by the Scientific Research Ethics Committee of the Çanakkale Onsekiz Mart University Graduate School of Education (date: March 30, 2021, no: E-84026528-050.01.04-2100049914) and the Provincial Directorate of Health. In addition, the study content was explained to the participants, and written and verbal consent were obtained.

RESULTS

In this study, the findings are discussed under the titles of descriptive features of the older adults, health conditions and some characteristics, prevalence of polypharmacy, and related factors.

DESCRIPTIVE FINDINGS

The mean age of the older adults was 73.60±6.87, while the average monthly income was 4524.00±3,822,24 ₺. Further, 56.1%, 66.3%, and 45% were women, married, and primary school graduates, respectively. The study comprised elderly who evaluated their general health status as excellent/good (56.8%), had a chronic disease (81.2%), and a history of falling (8.2%), emergency room visit (23.6%), and hospitalization (13.2%) in the last year.

DRUG USE CHARACTERISTICS OF THE OLDER ADULTS

Table 1 shows the characteristics of the regularly used prescription drugs; 83.8% (n=490) older adults used at least one prescription drug, while 24.1% (n=118) used five or more drugs (polypharmacy).

Table 2 shows the characteristics of over-the-counter drugs and alternative treatments used by the older adults. At least one over-the-counter drug was used by 51.6% older adults, while herbal medicines other than drugs and alternative treatments were

TABLE 1: Regularly used prescription drug characteristics of the older adults.

Variables		n	%
Presence of regularly used prescription drugs (n=585)	Yes	490	83.8
	No	95	16.2
Number of regularly used prescription drugs (n=490)	1-4	372	75.9
	5 and more (Polypharmacy)	118	24.1
Adherence to regularly used prescription drugs (n=585)	Regular	568	97.1
	Irregular	17	2.9
Reason for irregular use (n=14)*	Forgetting	2	14.3
	Thinking they don't need it	1	7.1
	Thinking it's too much	6	42.9
	Because of side effects	2	14.3
	Thinking the medicine is ineffective	3	21.4
Person keeping track of the regularly used drugs (n=488)	Themselves	398	81.6
	Spouse	13	2.7
	Kids	61	12.4
	Caregiver	5	1.0
	Other	11	2.3
Knowing why the drugs are used (n=488)	Knows all drug names and what diseases they are for	249	51.0
	Doesn't know the drug names but knows why they use it	101	20.7
	Knows some drugs	86	17.6
	Doesn't know any drug names/uses	52	10.7
Knowing the drugs' side effects (n=488)	Yes	238	48.8
	No	250	51.2
Undesired effects (n=488)	Yes	63	12.9
	No	425	87.1
Side effects (n=63)	Nausea	9	14.3
	Diarrhea	20	21.8
	Allergy	12	19.0
	Other	22	34.9

*Multiple response.

TABLE 2: Characteristics of the older adults using over-the-counter drugs and alternative treatments.

Variables		n	%
Use of unprescribed over-the-counter drugs (n=585)	Yes	302	51.6
	No	283	48.4
Over-the-counter drugs (n=302)	Pain relievers	284	94.0
	Aspirin	25	8.3
	Cold medicine	127	42.1
	Other	16	5.3
Use of herbal medicine (n=585)	Yes	305	52.1
	No	280	47.9
Herbal medicine used (n=922)	Sage	70	7.6
	Linden	300	32.5
	Rosehip	99	107
	Green tea	99	10.7
	Mint and lemon	173	18.8
	Fennel	40	4.3
	Senna	35	3.8
	Nettle	39	4.2
	Daisy	67	7.3
Reasons for using herbal medicine (n=527)	Disease prevention	163	30.9
	Healing properties	245	46.5
	Constipation	22	4.2
	Sleep regulation	13	2.5
	Regulating blood pressure	27	5.1
	Edema removal, diuretic	50	9.5
	For cancer	7	1.3
Herbal medicine suggestion source (n=62)	Doctor	1	1.6
	Friend-Neighbor	49	19.4
	TV-Newspaper-Internet	12	79.0
Presence of alternative treatment other than drugs (n=585)	Yes	71	12.1
	No	514	87.9
Alternative treatment suggestion source (n=71)	Friend	6	8.5
	TV-Newspaper-Internet	27	38.0
	Neighbors	14	19.7
	Other	24	33.8
Was the doctor informed about the alternative treatment used (n=71)	Yes	24	33.8
	No	47	66.2

used by 52.1% and 12.1% older adults, respectively.

FACTORS ASSOCIATED WITH POLYPHARMACY

The relationship between some characteristics of the older adults and polypharmacy is given in Table 3. Accordingly, polypharmacy presence had a significant relationship between education level, regular sleep, life satisfaction, perception of health, history of applying to the emergency department in the last year, hospitalization in the last year, and the number of chronic diseases ($p<0.05$).

For multivariate analysis, the associated factors identified in the previous analyses ($p<0.05$) were included in the logistic regression analysis. The results showed that older adults with four or more chronic diseases were in a state of polypharmacy approximately nine times (95% CI: 3.02-26.75) more than those with 1-3 chronic diseases (Table 4).

DISCUSSION

This study showed that the prevalence of polypharmacy was 24.1% in older adults living in a rural area

TABLE 3: The relationship between some characteristics of the older adults and polypharmacy.

	No polypharmacy		Polypharmacy			
Characteristics	**n**	**%**	**n**	**%**	χ^2	**p value**
Age						
65-74	222	78.4	61	21.6	2.357	0.308
75-84	117	72.7	44	27.3		
85 and older	33	71.7	13	28.3		
Sex						
Female	220	78.0	62	22.0	1.596	0.206
Male	152	73.1	56	26.9		
Marital status						
Married	245	75.4	80	24.6	0.660	0.719
Single	7	87.5	1	12.5		
Divorced/Widowed	120	76.4	37	23.6		
Educational status						
No education	67	68.4	31	31.6	13.171	**0.004**
Primary school graduate	167	72.3	64	27.7		
Secondary school graduate	25	86.2	4	13.8		
High school and above	113	85.6	19	14.4		
Employment status						
Yes	25	80.6	347	75.6	0.404	0.525
No	6	19.4	112	24.4		
Smoking						
Yes	48	85.7	8	14.3	3.319	0.069
No	324	74.4	110	25.3		
Alcohol use						
Yes	18	81.8	4	18.2	0.439	0.508
No	354	75.6	114	24.4		
Regular sleep						
Yes	253	81.4	58	18.6	13.741	**0.000**
No	119	66.5	60	33.5		
Regular physical activity						
Yes (Walking)	76	79.2	20	20.8	0.689	0.406
No	296	75.1	98	24.9		
Life satisfaction						
Unsatisfied	19	57.6	14	42.4	15.673	**0.000**
Indecisive	68	66.0	35	34.0		
Satisfied	285	80.5	69	19.5		
Health perception						
Excellent-good	214	85.9	35	14.1	30.679	**0.000**
Moderate	139	67.5	67	32.5		
Bad	19	54.3	16	45.7		
Presence of chronic disease						
Yes	356	75.4	116	24.6	1.720	0.150
No	16	88.9	2	11.1		
Number of chronic diseases						
1-3	351	77.7	101	22.3	28.647	**0.000**
4 and above	5	25.0	15	75.0		
History of falling in the previous year						
Yes	31	67.4	15	32.6	2.019	0.155
No	341	32.6	103	23.2		
History of emergency admission in the previous year						
Yes	78	65.5	41	34.5	9.249	**0.002**
No	294	79.2	77	20.8		
History of hospitalization in the previous year						
Yes	43	62.3	26	37.7	8.124	**0.004**
No	329	78.1	92	21.9		

χ^2: Chi square, $p<0.05$ significant.

TABLE 4: Logistic regression analysis studying variables associated with polypharmacy.

Variables	B	Wald	p value	Exp (B)	95% CI Lower	95% CI Upper
Education level						
High school and below (RC)	-0.350	1.320	0.251	0.704	0.388	1.280
University and above						
Regular sleep						
Yes (RC)	-0.284	1.269	0.260	0.752	0.459	1.234
No						
Life satisfaction						
Unsatisfied (RC)						
Indecisive	0.550	1.189	0.276	1.733	0.645	4.657
Satisfied	0.415	2.032	0.154	1.515	0.856	2.681
Health perception						
Excellent-good (RC)						
Moderate	-0.894	2.979	0.084	0.409	0.148	1.129
Bad	-0.168	0.124	0.725	0.845	0.332	2.154
History of emergency admission in the previous year						
Yes (RC)						
No	0.334	1.298	0.255	1.397	0.786	2.482
History of hospitalization in the previous year						
Yes (RC)						
No	0.127	0.129	0.720	1.135	0.569	2.265
Number of chronic diseases						
1-3 (RC)						
4 and above	2.196	15.585	**0.000**	8.992	3.022	26.757
Constant	0.208	0.333	0.532	1.231		

Hosmer and Lemeshow Test: 0.985; Nagelkerke R Square: 0.180; RC: Reference category; CI: Confidence interval.

of Türkiye. Previously, in a study conducted to evaluate the prevalence of polypharmacy among older adults in 17 European countries and Israel, the prevalence of polypharmacy ranged from 26.3-39.9%. In the same study, Switzerland, Croatia, and Slovenia had the lowest polypharmacy prevalence, whereas Portugal, Israel, and the Czech Republic had the highest polypharmacy levels.[11] Further, the prevalence of polypharmacy was reported to be 24.1% in England, 46.6% in Korea, and 85.3% in Egypt.[12-14] Previously, highly variable polypharmacy prevalence rates ranging from 17.2% to 82.7% have been reported in Türkiye.[15-17] Notably, the prevalence of polypharmacy is highly variable, which may be due to differences in the geographic locations, clinical practice guidelines, and polypharmacy definitions.[6]

In this study, univariate and multivariate analyses revealed that certain factors are associated with polypharmacy; one of them was the education status. Although previous studies have also associated education status with polypharmacy, such a relationship was not detected in other studies.[6,14,15,18,19] Nevertheless, a parallel relationship between the rational drug use and education status is expected, which can lead to a decrease in polypharmacy.

Regular sleep was identified as the variable associated with polypharmacy in our study. In a study by Lande and Gragnani the use of an increasing number of drugs did not affect the total sleep duration but negatively affected the sleep cycle.[20] According to Küçükdağlı's study, sleep disorders were independently associated with polypharmacy.[17] Furthermore, another variable associated with polypharmacy was life satisfaction; this outcome was expected because multiple morbidities significantly affect the health satisfaction and quality of life of aged.[21] Finally,

health perception was also a polypharmacy variable in our study. In a study conducted in Finland, patients who perceived their health as "bad" used drugs approximately 2 times more.[22]

Self-reported health is likely to decline due to multiple morbidities. Our study found a significant relationship between polypharmacy and emergency admission or hospitalization history in the last year. In a cohort study of approximately three million older adults in Korea, polypharmacy was found to be associated with a higher risk of hospitalization among older individuals.[13] It has been emphasized that drug interactions due to polypharmacy in the older adults may be a grave risk for hospital and emergency admissions.[23] Furthermore, it is also possible that healthcare services are overused because of multiple morbidities.

In this study, patients with four or more chronic diseases were in a state of polypharmacy approximately nine times (95% CI: 3.02-26.75) more than those with 1-3 chronic diseases. Previous studies support this finding.[15,18] A correlation is expected between the number of chronic diseases and number of drugs prescribed, supporting the hypothesis that polypharmacy is mostly a reflection of chronic multimorbidity.[24]

In this study, no significant relationships were observed in age, sex, marital status, cohabitants, employment status, income perception, smoking, alcohol use, regular physical activity, history of falling in the previous year, and the presence of chronic diseases and polypharmacy ($p>0.05$). However, studies have shown a relationship between the polypharmacy and age, sex, marital status, employment status, income perception, smoking, alcohol use, regular physical activity, history of falls in the last year, and presence of chronic disease.[6,10,12,14,15,18,19,25] The results of this study may have been affected by the characteristics of the samples.

Although this is the first known study in Hayrabolu to determine the polypharmacy status of the older adults and the associated factors, it has some limitations. First, the questionnaires were self-reported by the older adults; older adults may give incorrect statements due to memory issues. Second, the study included only those older adults who visited the family health centers, and hence, older adults who could not visit family health centers were not included.

CONCLUSION

This study showed that from the total study population of older adults, approximately one-fourth had polypharmacy, approximately half were using non-prescription drugs, and half were using herbal medicines. In addition, some results are thought to be related to polypharmacy. In line with these findings, it can be suggested that the older adults should be evaluated for prescription and non-prescription drug use, and the rational drug use education should be provided. Furthermore, future studies should focus on identifying or developing effective interventions for preventing polypharmacy.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy;* ***Design:*** *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy;* ***Control/Supervision:*** *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy;* ***Data Collection and/or Processing:*** *Elif Aslıhan Korkmaz;* ***Analysis and/or Interpretation:*** *Melike Yalçın Gürsoy;* ***Literature Review:*** *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy;* ***Writing the Article:*** *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy;* ***Critical Review:*** *Melike Yalçın Gürsoy;* ***References and Fundings:*** *Elif Aslıhan Korkmaz, Melike Yalçın Gürsoy.*

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