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**Research**

**Research Title**

**Prevalence and risk of polypharmacy among community-dwelling elderly Kuwaiti patients**

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**الملخص باللغة العربية :**

**يعتبر قطاع المسنين بين السكان من القطاعات الاخذة فى التزايد . وحيث انهم اطول عمرا فغالبا يكونوا اكثر عرضة لكثير من الأمراض المزمنة. وبالتالى فأنهم يتناولواالعديد من الأدوية المختلفة، على الرغم من انخفض حصانتهم ضد هذة المواد الكيمائية المختلفة مما يعرضهم للكثير منها المخاطر التى تتجاوز الفائدة العلاجية لهذة الادوية.**

**وعلية فأن هذة الدراسة تهدف الى تحديد مدى انتشار هذة المشكلة بين كبار السن الكويتين ، مع وصف عدد وانواع الأدوية المستخدمة وتحديد عوامل الخطر المرتبطة بهذا الاستخدام المتعدد.**

 **العينة وطرق البحث:**

**هذة دراسة وصفية مستعرضة تعتمد على استبيان لاستقصاء البيانات . حيث تم مقابلة 500 من المرضى الكويتين الذين تزيد اعمارهم عن 65 سنة. ولقد تم انتقاء المرضى من العيادات الطبية للمسنين وعيادات متابعة الأمراض المزمنة في مراكز الرعاية الصحية الأولية التابعة لمحافظات الكويت الست . وتم أجراء المقابلات مع المرضى بواسطة ممرضة مدربة على استخدام الاستبيان .ولقد تم جمع البيانات خلال فترة أربعة أشهر من آذار/مارس إلى تموز/يوليه عام 2017. ولقد تم تعريف الاستخدام المتعدد للادوية (بوليفارماسي) بأنة الاستخدام المتزامن لخمسة أو أكثر من أنواع مختلفة من الأدوية.ولقد تم عمل التحليلات الاحصائية اللازمة لدراسة العلاقة بين استخدام الادوية والبيانات الديموغرافية وكذلك بين عوامل الخطورة مثال عدد مرات الدخول للمستشفيات وعدد العيادات التى يراجعها المريض وايضا عدد الامراض التى يعانى منها المريض**

**النتائج: كون الذكور اثنان وخمسون في المائة (260) من المرضى الذين تم دراسة حالاتهم ، مع متوسط العمر من 71.73± سنوات 5.32. وكان نسبة الاستخدام المتعدد للادوية (بوليفارماسي 5-8 الأدوية) و الاستخدام المتعدد للادوية المفرط (بوليفارماسي المفرطة اكثر من 8 عقارات ) 58.4 في المائة (292)، و 10.2% (51) على التوالي. عوامل الخطر المرتبطة بزيادة عدد الأدوية المستخدمة كانت الإناث ، انخفاض مستوى التعليم هذه بالإضافة إلى عدد مرات الحجز بالمستشفيات ، وعدد العيادات التى يراجعها المريض. وكانت اكثر الادوية استخداما هى الادوية المستخدة لتنظيم مستوى السكر بالدم ولأدوية الخافضة للضغط.**

**الاستنتاج: قطاع كبير من المرضى المسنين الكويتين ينطبق عليهم تعريف الاستخدام المتعدد للادوية ومعرضين لمخاطرها المحتملة.وتقوم النتائج التي توصلت إليها الدراسة الحالية بتسليط الضوء على الحاجة إلى تنقيح سياسة صرف الادوية للمرضى المسنين الكويتين ويضاف الى ذلك، الشروع في البرامج التعليمية بين العاملين في الرعاية الصحية حول العديد من الاحتياطات الواجب اتباعها عند وصف الادوية لهذا القطاع من المرضى.**

**Abstract:**

**Older people are a growing population. They live longer but often have multiple chronic diseases. As a consequence, they are taking many different kinds of medicines, while their vulnerability to pharmaceutical products is increased and this exposes many of them to risks beyond the point where drug therapy is useful.**

**Objectives: To estimate the prevalence of polypharmacy in community-dwelling, elderly Kuwaiti patient. Also to Describe the number and type of drugs used, as well as Identifying risk factors associated with polypharmacy.**

**Subjects and Methods:**

**A descriptive cross-sectional questionnaire-based survey. In which we interviewed 500 community-dwelling older Kuwaiti adults over 65 years of age. We used Non-probability convenient sampling method. Recruiting of the potential participants was from geriatric clinics and chronic diseases follow-up clinics in the primary health centres in the six Kuwaiti governorates. Participants were interviewed by a trained nurse using a structured questionnaire. The data Collection occurred during a four-month period from March to July 2017. Polypharmacy was defined as the concomitant use of five or more different kinds of medicines; It’s relation with the demographic data and other risk factors as hospital admission, number of clinics visited by the patient and number of comorbidities were studied using multivariate models.**

**Results:**

**Fifty-two percent (n=260) of the patients were males, with a mean age of 71.73± 5.32 years. The prevalence of polypharmacy (5-8 drugs) and excessive polypharmacy (> 8 drugs) were 58.4% (n=292), and 10.2% (n=51) respectively. The risk factors associated with an increased number of used medicines were female gender (Chi-square 7.97, df 2 and P 0.019), a lower level of education (Chi-square 26.919, df 10 and P 0.003), and a high number of hospital admissions (Chi-square 81.76, df 8 and P 0.000), the clinics visited by the patient (Chi-square 95.77, df 4 and P 0.000), and number of comorbidities (Chi-square 120.936, df 4 and P 0.000). The most commonly used medications were blood-glucose-lowering agents, and antihypertensive drugs used by119.8 %( 599), and 114.4 %( 573) of patients respectively.**

**Conclusion:**

**A significant sector of the older Kuwaiti patients population has a high prevalence of polypharmacy and thus are exposed to its potential hazards. The current study highlights the need to revise the drug-dispensing policy among the community-dwelling older Kuwaiti population. Adding to this, the initiation of educational programs among healthcare practitioners about prescribing issues in older individuals.**

**Keywords**

**Polypharmacy, Co-morbidity, Prevalence, Risk factors**

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# Introduction

**The use of drugs in older adults has received much consideration in recent years. The prevalence of multiple drug medications in frail elderly is on increase. Multiple drug use refers to polypharmacy (PP), which is considered as a well-known risk factor in the elderly as their vulnerability to pharmaceutical products is increased. Kuwaiti researchers still did not identify the magnitude of PP as well as the risk factors associated with it in elderly Kuwaiti patients. In order to optimize the use of medicines, we have to find an equilibrium between the adequate treatment of diseases and avoiding the side effects of drugs.**

# Background & Literature Review

**The United Nation Department of Economic and Social Affairs revealed that population older than 60 years is expected to grow by 56% globally between 2015 and 2030, and those over the age of 65 will make more than half of the world's population by the year 2030[1].**

**The use of drugs in older adults has received much consideration in recent years. Several studies are showing an increasing prevalence of multiple drug medications in frail elderly population. Older people often have multiple chronic diseases, which accumulate with age, and doctors have to follow evidence-based guidelines for chronic disease management [2]. Multiple drug use refers to polypharmacy (PP), which is of particular public health concern in old people [3]. An agreement on the definition of PP is still lacking. The WHO defines PP as "the administration of many drugs at the same time or the administration of an excessive number of drugs"[4]. A simple definition of PP is “taking five or more medicines concomitantly"[5]. Another definition of PP is the "consumption of more medicines than clinically indicated or by the consumption of medicines that are not clinically indicated"[6]. The use of multiple drug treatments can be clinically appropriate for individuals suffering from different diseases if it improves their health and quality of life. However, PP is also a well-known risk factor in the elderly as their vulnerability to pharmaceutical products is increased and due to drug-drug interactions, adverse drug reactions, and low adherence to drug therapy. Polypharmacy poses essential challenges to clinicians as it exposes many older adults to risks beyond the point where drug therapy is useful [7]. Also, it is assumed to cause needless health expenditure, directly due to redundant drug sales and indirectly due to the increased level of hospitalization caused by a drug-related adverse effect [8]. Accordingly, there have been many efforts to lessen the number of prescribed drugs to individuals experiencing PP, especially for the elderly [9].**

**Physician, pharmacists, and patients are all responsible. Suboptimal and inappropriate prescribing usually ends with PP. Suboptimal prescribing associated with PP include the prescription of more than one medicine with the same effect or prescribing medications with drug-drug interactions [10]. Prescribing cascade occurs when physicians prescribe additional drugs to treat the side effects of other drugs [11]. Patients also are responsible for the problem by self-medicating, failing to follow the instruction of doctors, nor reporting all medications or Over the Counter (OTC) products used.**

**Kuwaiti researchers still did not identify the magnitude of PP as well as the risk factors associated with it in elderly Kuwaiti patients. These risk factors may be related to gender, age category, level of education as well as to number of hospital admissions, number of visited clinics and number of co-morbidities. In order to optimize the use of medicines, we have to find an equilibrium between the adequate treatment of diseases and avoiding the side effects of drugs. It is imperative to identify both modifiable factors influencing the occurrence of PP and the inappropriate practices. Accordingly, we can develop programs to modify these factors and promote safe care for elderly patients.**

**Our hypothesis that the problem of PP and its worrisome consequences may exist in many Kuwaiti elderly patients.**

**This study aims to estimate the prevalence of PP in community-dwelling, elderly Kuwaiti patient, to describe the number and type of drugs used and to identify risk factors associated with PP.**

# Methods and Materials

**Study design;**

**- A descriptive cross-sectional questionnaire-based survey**

**Inclusion criteria;**

**Community-dwelling Kuwaiti elderly patients, over 65 years, who can communicate coherently and relevantly and agree to participate in the study.**

**Study sample;**

**We used Non-probability convenient sampling method. Recruiting of the potential participants was from geriatric clinics and chronic diseases follow-up clinics in the primary health centers in the six Kuwaiti governorates. The sample size was 500 elderly patients, and the number of recruited cases from each governorate was according to the ratio of its population to the total Kuwaiti population.**

**Data collection;**

**Data was collected over four- months’ period from March to July 2017. The data gathered using a questionnaire compiled by similar studies. A trained nurse fulfilled it during an interview with the patient at their respective health care centers. Ethical clearance was obtained from the “The Standing Committee coordinating medical and health research, in the ministry of health of Kuwait, research number 2016/430”. All participants answered a questionnaire, after fulfilling an informed consent to participate in the study.**

**Survey development;**

**- The questionnaire included three sections:**

**1. The first included demographic data; age, sex, level of education, social status, residency, monthly income, and body mass index.**

**2. The second section included questions about the current health problems, a list of the medications in use whether with prescription or over the counter medications.**

**We classified medications according to the WHO Anatomical Therapeutic Chemical (ATC) classification system [12].**

**3. The third section-encompassed questions revealing the pattern of drug use, and awareness about proper use as well as identifying any side effects related to the utilization of these medications. Overcoming information bias was by avoiding the leading questions in the questionnaire, and offering categorized values for subjects to select instead of requesting specific values.**

**Data analysis;**

**We checked the collected questionnaires for completeness before data entry. For the Statistical procedure, we used SPSS (SPSS Inc., Chicago, IL, USA) for Windows statistical package; release Analysis of demographic variables done by the use of Pearson’s chi-square test for categorical data. Calculation of the p-value achieved by using the ANOVA test for continuous variables and chi-squared test for categorical variables. For all significant differences, we calculate the Odds ratios and confidence intervals. We considered a p-value below 0.05 as statistically significant. We did a Multivariate ordinal logistic regression to estimate odds ratios (ORs) and their 95% confidence intervals (CI) to investigate the possible risk factors for PP.**

**Study definitions;**

**The non-polypharmacy (NP) subgroup included patients using four or fewer drugs concomitantly. The use of five to eight drugs during the last 3-month period was the cut-offs indicating the existence of PP while the use of more than eight drugs indicates excessive polypharmacy (EPP) [6]. The counted medications included prescribed, and over-the-counter (OTC) medications including dietary supplements such as herbal minerals, and vitamins. We counted combined formulations as separate medications.**

# Results & Discussions

**Five hundred patients were enrolled in this study. Age of the patients ranged from 65 to 87 years, with an average of 71.73± 5.32 years. Fifty percent (250) of the studied patients were between 65-70 years, 22% (110) between 71-75 years, 22.8 %( 114) between 76-80 and only 5.2% (26) were over 80 years. Males made up 52% (260) of the sample. Fifty-six percent of the patients had an education level less than secondary school, and 44% had finished their secondary school or higher. Table 1 provides information about the demographic data of the patients.**

**Our study showed a PP prevalence of 58.4% (292); while that of NP and EPP was 31.4% (157) and 10.2% (51) respectively.**

**The most commonly used drugs by our patients were blood glucose lowering agents, so 82.6% (413) of the patients used blood glucose lowering agents excluding insulin, and 37.2 %(186) used insulin and analogs. Other commonly used medications were antihypertensive drugs and lipid-modifying agents. Table 2 shows a detailed description of the various medications used by the studied cases.**

**Results of the Chi-square Test of Independence showed a statistically significant relationship between PP and several potential risk factors. Table 3 The percentage of females in the EPP subgroup was significantly higher than males 14.2% Vs 6.5%, (χ2 (2) = 7.97, p = .019). Patients with less than secondary school education showed a higher percentage of EP with a statistically significant difference when compared with those with a level of education higher than secondary school, 14.7% versus 4.5%, respectively (χ2(10) = 26.92, p = .003). According to the number of hospital admissions in the last two years, we divided the patients into three subgroups. The first subgroup with no history of hospital admissions, second subgroup 1-2 admissions, and the third were those with more than two admissions. The study showed a statistically significant incremental increase in the percentage of PP from the first to the third subgroup, 39%, 66.8%, and 80% respectively. Also, the percentage of EPP was increased from 6.4% in the first group to 11.6% and 17.5 % in the second and third groups respectively (χ2 (8) = 81.76, p < .001). A significant relationship between the number of drugs taken by the patient and a positive history of falls and unbalance, so in patients with NP, only 15.3% gave a history of falls or unbalance, this in comparison to 45.5%, and 60.8% in patients with PP and EPP (χ2(2) = 52.86, p < .001). Considering the relationship between the number of clinics revised by the patient and PP, patients who revised only one clinic had a higher percentage of NP when compared with those who revised two or more than two clinics, 62.4% Vs. 22.5% Vs. 3.8% respectively, p<.001. On the contrary, patients who revised more than two clinics had a higher percentage of EPP when compared with those who were revising two or one clinics, 38.5% vs. 9.8% vs. 5.6% respectively, p<. 001. The results showed a statistically significant incremental increase in the percentage of PP and EPP as the number of comorbidities increases, p<.001[Fig. 1]**

**On the other hand, there was no statistically significant relationship between PP and the different age subgroups above 65 years, social status. Besides, whether the patient lives with his family or alone did not affect PP. Table 4.**

**Discussion**

**Despite increasing alertness to adverse reactions related to multi-drug exposure, the prevalence of PP remains high in older adults. The most worrying concern of PP is not only the occurrence of adverse drug reactions, but also affection for patient quality of life and increased drug costs are significant issues [13]. Currently, no data is available for the prevalence of PP in community-dwelling Kuwaiti elderly patients. This study aimed to assess the prevalence, commonly used drugs and risk factors associated with PP, among older adults taking chronic medications in the community setting in Kuwait.**

**All the studied patients were above 65 years. The prevalence of PP and EPP were 58.4 % (292) and 10.2 % (51) respectively. Previous studies showed a similarly high prevalence of PP in other countries such as Sweden and China [14]. A study of Korean elderly showed higher PP prevalence of 86.4% had PP [15].**

**Several previous studies showed the association between endocrine or cardiovascular disease and a significant increase in medication use in comparison to other disease conditions [16]. In the current study, blood glucose lowering agents, were the most commonly used drugs, so 82.6% (413) of the patients used blood glucose lowering agents excluding insulin, and 37.2 %(186) used insulin and analogs. Other commonly used medications were antihypertensive drugs and lipid-modifying agents. In Kuwait, the prevalence of type 2 diabetes is 25.4%, which increases to 56.3% in the age group >55 years, and that of hypertension is 28%. The prevalence of co-occurrence of diabetes and hypertension is 11%, and this increases to 17% in the age group of 40–70 years [17]. Prior reports found that elderly patients with hypertension and diabetes might be overly treated to reach predetermined treatment targets. This aggressive treatment may expose the patients’ to attacks of hypoglycemia and hypotension, which in turn may lead to falls, head injuries, or fractures. All that could have a negative impact on the patient physical function and quality of life [18]. Therefore, many treatment strategies recommend a less intensified approach in managing elderly patients suffering from diabetes mellitus or hypertension, [19] though this may not widely be practiced [20]. Although the prescription of multiple drugs to patients with co-morbid conditions can improve their health status, and clinical condition, PP also has the potential to increase the risk of adverse drug interactions; for example, hyponatremia or postural hypotension with diuretics or antihypertensive agents. These side effects can sometimes be severe enough to necessitate hospital admission and can occasionally even result in death.**

**Linking PP to sex is variable in the literature. In a study by Jurka J et al., polypharmacy was higher in males when compared to females [21]. Conversely, many other studies have reported a correlation between PP and females [18]. In the current study, 14.2% of females were in the EPP, in comparison to 6.5% of the male group, and this difference was statistically significant (p = .019). Payne et al. did a Scottish study showing a similar finding [13]. Such differences among study findings could be due to dissimilarities in physicians’ prescription attitude toward males or females, whom also may have differences in their educational and socioeconomic characteristics. The association between gender and PP may need more elaboration through the future researches.**

**Our results suggested a significant relationship between PP and some other potential risk factors. The level of education was a significant risk factor for PP. Results showed that patients with less than secondary school education had a high percentage of EPP with a statistically significant difference when compared with those with a level of education higher than secondary school, 14.7% versus 4.5%, respectively (p = .003). Haider SI et al. documented the same findings; were subjects with low education in their study had a higher probability of PP and EPP [22]. A Cross-European study by Gallagher and colleagues reported the admission to hospital as an important driving factor behind PP [23]. In the current study, the effect of hospital admissions on the number of drugs taken was evident. Results showed a statistically significant incremental increase in the percentage of PP, and EPP in relations to the number of hospital admissions (χ2 (8) = 81.76, p < .001). The study of Hong-Ah Kim et al. showed that PP was more frequent with an increasing number of visits to different healthcare organizations [15]. Our results showed a statistically significant correlation between the number of drugs taken and the number of clinics revised by the patient (p < .001). Previous reports indicated that overlapping medications with the switching of healthcare providers are a severe problem [24]. Multi-clinic visits encourage over-prescription, which invariably leads to PP, as more than one doctor are responsible for the treatment of the same patient. Kuwaiti patients have a fully covered health insurance system, and they are paying nothing for health services. In many times the patient does revise clinics for the only minor complaints. Another issue in Kuwait that most of the physicians in the outpatient clinics are non-Kuwaiti and this makes it difficult for them to refuse the demands of Kuwaiti patients. Richardson K et al. showed in a univariate analysis that the incidence of PP in individuals paying for health insurance or health services is less than in those receiving free or subsidized healthcare services [25]. The older people, which often suffers from multiple chronic diseases requiring multiple medications, continues to increase. Reviewing the literature, showed that an increasing number of comorbidities is one of the predictors of PP in the elderly [15,16].**

**Our results showed a statistically significant incremental increase in the percentage of PP and EPP as the number of comorbidities increases. Patients with comorbid medical conditions always require several drugs to treat each condition. It is rational for those patients to be on 6-8 medications to reduce their long-term risk for those conditions [26]. The increase in the prevalence of PP with comorbidities may be due to several reasons of which changes in evidence-based recommendations. Also, the introduction of new specific drugs for the management of certain conditions or diseases may have a role. Finally, Physicians are now prescribing more drugs for preventive use. Altogether, these factors may have resulted in a change in the prescription patterns. There is a strong association between PP in older individuals and multiple negative health outcomes which include increased costs of health care [27], functional disabilities, falls [28], harmful drug-drug interactions [29], and adverse drug reactions [30]. Our results showed a significant correlation between the number of drugs taken by the patient and a positive history of falls and unbalance. Patients with NPP, only 15.3% gave a history of falls or unbalance. This in comparison to 45.5%, and 60.8% in patients with PP and EPP respectively (p < .001).**

**Of the limitations of this study, that we did not relate the incidence of falls to the use of specific medications, but we relate it to the total number of drugs used. Other limitations may be related to inaccuracy in recording dietary supplements, with underestimation of the true prevalence of PP.**

# Conclusion

**A significant sector of elderly Kuwaiti patients has a high prevalence of polypharmacy with its potential hazards. The findings of the current study highlight the need to revise drug-dispensing policy among the community-dwelling elderly Kuwaiti population. Adding to this, the initiation of educational programs among healthcare practitioners about prescribing issues in older individuals. Individuals diagnosed with diabetes mellitus and cardiovascular diseases are more susceptible to polypharmacy so physicians and pharmacists should be cautious of that to prevent any adverse effects of drug-drug interactions.**

# Future research

**Linking polypharmacy to sex is variable in the literature. Such differences among study findings could be due to dissimilarities in physicians’ prescription attitude toward males or females, whom also may have differences in their educational and socioeconomic characteristics.**

**Elaboration of the association between gender and multiple drug consumptions will be the future research.**

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# Appendices

|  |  |  |
| --- | --- | --- |
| Table 1 |  |  |
| Demographic data of patients |  |  |
| Variable | *n* | *%* |
| Age |  |  |
|     65 -70 | 250 | 50.0 |
|     71-75 | 110 | 22.0 |
|     76-80 | 114 | 22.8 |
|     more than 80 | 26 | 5.2 |
| Sex |  |  |
|     Female | 240 | 48.0 |
|     Male | 260 | 52.0 |
| Level of education |  |  |
|    Less than secondary school | 278 | 55.6 |
|    Higher than secondary school  | 222 | 44.4 |
| Social status |  |  |
|     married | 371 | 74.2 |
|     widow | 109 | 21.8 |
|     single | 14 | 2.8 |
|     divorced | 6 | 1.2 |
| Residency |  |  |
|     with the family | 480 | 96.0 |
|     alone | 20 | 4.0 |
| Monthly income |  |  |
|     1000-2000 | 217 | 43.4 |
|     600- 1000 | 186 | 37.2 |
|  Less than 600 K.D. | 50 | 10.0 |
|     more than 2000 | 47 | 9.4 |
| BMI\* |  |  |
|     18.5-24.9 | 344 | 68.8 |
|     25-29.9 | 119 | 23.8 |
|     less than 18.5 | 23 | 4.6 |
|     over 30 | 13 | 2.6 |
|     25-29.5 | 1 | 0.2 |

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| --- | --- | --- |
| Table 2 |  |  |
| Medications used by the patients |  |  |
| Medications | n | % |
|     Blood glucose lowering agents excluding insulin | 413 | 82.6 |
|  Insulin and analogs  | 186 | 37.2 |
| Antihypertensive medications |  |  |
|     Calcium channel blockers | 217 | 43.4 |
|  Agents acting on the angiotensin system. |  |  |
|  Angiotensin II antagonists | 100 | 20 |
|      Plain ACE inhibitors used by  | 97 | 19.4 |
|      Agents acting on the angiotensin system and diuretics | 63 | 12.6 |
|     Selective beta-blocking agents | 96 | 19 |
| Lipid-modifying agents, statins | 333 | 66.6 |
| Acetylsalicylic acid preparations  | 303 | 6o.6 |
| Supplements | 297 | 59.4 |
| Proton pump inhibitors | 126 | 25 |
| Bronchodilators  | 89 | 18 |
| Thyroid hormones.  | 70 | 14 |
| Benzodiazepines | 18 | 3.6 |
| Antidepressants  | 12 | 2.4 |

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| Table 3 |  |  |  |  |  |  |  |
| Relationship between polypharmacy and potential risk factors[significant relations] |
|  |  | Number of Drugs |  |  |  |
| Studied factor |  | 0 to 4 | 5 to 8 | > 8 | χ2 | *df* | *p* |
|  | n(%) | n(%) | n(%) |  |  |  |
| Sex | Female(240) | 71(29.6) | 135(56.3) | 34(14.2) | 7.97 | 2 | .019 |
| Male(260) | 86(33.1) | 157(60.4) | 17(6.5) |  |  |  |
| Level of education | < 2ry school | 76(27.3) | 161(57.9) | 41(14.7) | 26.92 | 10 | .003 |
| >2ry school | 81(36.5) | 131(59.0) | 10(4.5) |  |  |  |
| Hospital admissions | None(174) | 95(54.6) | 68(39.0) | 11(6.4) |  |  |  |
| 1-2(286) | 61(21.3) | 191(66.8) | 34(11.6) |  |  |  |
| >2(40) | 1(2.5) | 32(80.0) | 7(17.5) | 81.76 | 8 | <.001 |
| History of falls  | No(312) | 133(84.7) | 159(54.5) | 20(39.2) |  |  |  |
| Yes(188) | 24(15.3) | 133(45.5) | 31(60.8) | 52.86 | 2 | < .001 |
| Number of revised clinics | One(125) | 78(62.4) | 40(32.0) | 7(5.6) |  |  |  |
| Two(346) | 78(22.5) | 234(67.6) | 34(9.8) |  |  |  |
| >two(26) | 1(3.8) | 15(57.7) | 10(38.5) | 95.77 | 4 | <.001 |
| Number of comorbidities  | 1-2(104) | 76(73.0) | 27(26.0) | 1(1.0) | 120.93 | 4 | <.001 |
| 3-4(272) | 70(25.7) | 174(64.0) | 28(10.3) |  |  |  |
| >4(124) | 11(8.9) | 91(73.4) | 22(17.7) |  |  |  |

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| Table 4 |  |  |  |  |  |  |  |
| Relationship between polypharmacy and potential risk factors[insignificant relations] |
|  |  | Number of Drugs |  |  |  |
| Studied factor |  | 0 to 4 | 5 to 8 | > 8 | χ2 | *df* | *p* |
|  | n(%) | n(%) | n(%) |  |  |  |
| Age subgroups | 65 -70 | 88(35.2) | 141(56.4) | 21(8.4) | 7.70 | 6 | 0.261 |
| 71-75 | 29(26.4) | 69(62.7) | 12(10.9) |   |   |   |
|  | 76-80 | 31(27.2) | 66(57.9) | 17(14.9) |   |   |   |
|  | > 80 | 9(34.6) | 16(61.5) | 1(3.9) |   |   |   |
| Residency | alone | 9(45) | 10(50) | 1(5) | 2.03 | 2 | 0.36 |
| With family | 148(30.9) | 282(58.7) | 50(10.4) |  |  |  |
| Social status | married | 120(32.3) | 215(57.9) | 35(9.4) | 6.68 | 6 | 0.35 |
| widow | 29(26.6) | 68(62.4) | 12(11) |  |  |  |
| single | 6(42.8) | 6(42.8) | 2(14.2) |  |  |  |
|  | divorced | 2(33.3) | 2(33.3) | 2(33.3) |  |  |  |

Figure 1

Showing the relation between the prevalence of NP, PP, and EPP and the number of comorbidities

NP Non-polypharmacy

PP Polypharmacy

EPP Excessive polypharmacy