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ORIGINAL ARTICLE

Incidence and Risk Factors of Polypharmacy in Pediatric Outpatients: A Tertiary Care Analysis

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ABSTRACT

Background: Polypharmacy is an emerging concern in pediatric outpatient care, with increasing prevalence due to rising rates of chronic illness, frequent specialist visits, and overlapping prescriptions.

Objective: To determine the incidence of polypharmacy among pediatric outpatients and identify key demographic and clinical risk factors associated with it.

Methods: This cross-sectional descriptive study was conducted at Sahiwal Teaching Hospital , Sahiwal from February 2022 to July 2022. A total of 125 pediatric outpatients were enrolled in the study using non-probability consecutive sampling. After obtaining informed consent from the parents or guardians, data were collected using a pre-designed, structured questionnaire administered through interviews and review of outpatient prescription slips.

Results: The incidence of polypharmacy was found to be 24.8% (n = 31). Polypharmacy was significantly more common in children aged ≥11 years (p = 0.018), those with two or more comorbidities (p < 0.001), and those with ≥3 prior outpatient visits (p = 0.005). The most frequently prescribed medications included antipyretics (70.4%), antibiotics (60%), and antihistamines (51.2%). Multivariate analysis identified age ≥11 years (AOR: 2.65, 95% CI: 1.13–6.21), ≥2 comorbidities (AOR: 5.74, 95% CI: 2.18–15.11), and ≥3 prior visits (AOR: 3.41, 95% CI: 1.42–8.19) as independent predictors of polypharmacy.

Conclusion: It is concluded that nearly one in four pediatric outpatients are exposed to polypharmacy, primarily driven by age, multimorbidity, and frequent healthcare utilization. These findings highlight the need for routine medication reviews, coordinated care, and rational prescribing practices to reduce unnecessary drug burden in pediatric populations.

Keywords: Polypharmacy, Pediatrics, Outpatients, Risk Factors, Chronic Illness

INTRODUCTION

Polypharmacy, defined as the concurrent use of multiple medications, has long been recognized as a major concern in adult and geriatric populations. However, in recent years, attention has increasingly shifted to its rising prevalence among pediatric patients, particularly those in outpatient settings. While there is no universally accepted threshold for polypharmacy in children, most studies refer to the concurrent use of five or more medications as clinically significant[1]. This trend poses unique risks for children, who are especially vulnerable to the adverse effects of inappropriate prescribing due to developmental pharmacokinetic and pharmacodynamic differences, immature metabolic pathways, and narrow therapeutic windows[2]. The increase in chronic conditions among pediatric patients has significantly contributed to this phenomenon. Advancements in neonatal and pediatric care have improved survival rates of children with congenital anomalies, genetic syndromes, and chronic diseases such as cystic fibrosis, epilepsy, juvenile arthritis, ADHD, asthma, and type 1 diabetes mellitus[3]. These children frequently require complex and ongoing pharmacologic interventions, often involving multiple medications administered by various specialists. Consequently, pediatric polypharmacy has transitioned from a rare concern to a routine clinical challenge, especially in multidisciplinary outpatient clinics[4].

In outpatient settings, where continuity of care may be fragmented and follow-up intervals are longer, the risk of uncoordinated prescribing increases. It is not uncommon for children to be seen by pediatricians, neurologists, psychiatrists, or other subspecialists concurrently[5]. Each provider may prescribe medications based on their domain of expertise without full visibility into the complete medication profile of the patient. This can lead to duplication of therapy, harmful drug–drug interactions, therapeutic redundancy, and unnecessary medication use[6]. Furthermore, in countries with lax prescription regulations, over-the-counter (OTC) drugs, herbal supplements, and traditional medicines used by caregivers may further contribute to hidden polypharmacy[7]. Among the most concerning consequences of pediatric polypharmacy are increased adverse drug reactions (ADRs), hospitalization, poor medication adherence, behavioral disturbances, iatrogenic complications, and deterioration in overall quality of life. Studies suggest that the incidence of ADRs is significantly higher in children receiving multiple medications compared to those on monotherapy, and younger children are at particularly high risk due to limited communication skills and underdeveloped drug metabolism[8]. Additionally, polypharmacy may lead to prescribing cascades, where side effects of one medication are misinterpreted as new medical conditions, leading to the prescription of yet more drugs[9].

Risk factors for pediatric polypharmacy are complex and interdependent. Demographic variables such as increasing age (especially adolescence), urban residency, and higher parental education levels have been associated with increased medication use[10]. Clinical factors include the presence of multiple comorbidities, frequent healthcare utilization, and diagnoses related to psychiatric or neurological conditions, which are particularly prone to polypharmacy due to the widespread use of psychotropic medications[11]. Children with disabilities or those receiving home-based care may also be at increased risk due to the perceived need for symptom control across various functional domains[12].

Objective: This study aims to bridge that gap by systematically analyzing the incidence of polypharmacy among pediatric outpatients and identifying key demographic, clinical, and behavioral risk factors contributing to its occurrence.

METHODOLOGY

This cross-sectional descriptive study was conducted at Sahiwal Teaching Hospital , Sahiwal from February 2022 to July 2022.A total of 125 pediatric outpatients were enrolled in the study using non-probability consecutive sampling. Children aged 0 to 18 years who presented to the outpatient department during the study period and were prescribed at least one medication were included. Patients admitted to inpatient wards or receiving chemotherapy or specialized intensive care treatment were excluded to reduce

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confounding related to disease severity and protocol-driven prescribing.

Data Collection Procedure: After obtaining informed consent from the parents or guardians, data were collected using a pre-designed, structured questionnaire administered through interviews and review of outpatient prescription slips. The questionnaire captured sociodemographic details (age, gender, residence, parental education, and income level), clinical diagnoses, number and types of medications prescribed, and healthcare utilization history, including specialist consultations and previous prescriptions.

Definition of Polypharmacy: For this study, polypharmacy was defined as the concurrent use of five or more distinct medications prescribed at a single outpatient visit, in alignment with previous literature on pediatric polypharmacy thresholds. Medications were counted irrespective of formulation (e.g., syrup vs. tablet) or route (oral, inhaled, or topical), but combination drugs were counted based on the number of active pharmacologic ingredients.

Data Analysis: Collected data were entered and analyzed using IBM SPSS version 21. Descriptive statistics were calculated, including means and standard deviations for continuous variables and frequencies and percentages for categorical variables. The incidence of polypharmacy was calculated as the proportion of patients prescribed five or more medications. A multivariate logistic regression model was constructed to identify independent predictors of polypharmacy, with a significance threshold set at $p < 0.05$.

RESULTS

The age distribution showed a fairly even spread, with 27.2% of patients aged 1–5 years, 36.8% aged 6–10 years, and 36.0% aged 11–17 years. The gender distribution was slightly skewed towards males (54.4%) compared to females (45.6%). A majority of patients (64.8%) resided in urban areas, with the remaining 35.2% living in rural areas. Regarding comorbidities, 40.8% of patients had no comorbidities, 32.8% had one, and 26.4% had two or more. Only 24.8% of patients were on polypharmacy (≥5 drugs), while 75.2% were not.

Table 1: Sociodemographic and Clinical Characteristics of Pediatric Outpatients (n = 125)

Characteristic	Category	Frequency (n)	Percentage (%)
Age Group (years)	1–5	34	27.2%
	6–10	46	36.8%
	11–17	45	36.0%
Gender	Male	68	54.4%
	Female	57	45.6%
Residence	Urban	81	64.8%
	Rural	44	35.2%
Number of Comorbidities	None	51	40.8%
	One	41	32.8%
	Two or more	33	26.4%
Polypharmacy	Yes (≥5 drugs)	31	24.8%
	No (<5 drugs)	94	75.2%

Table 2: Association Between Risk Factors and Polypharmacy

Variable	Polypharmacy (n=31)	Non-Polypharmacy (n=94)	p-value
Age ≥11 years	17 (54.8%)	28 (29.8%)	0.018*
≥2 Comorbidities	21 (67.7%)	12 (12.8%)	<0.001*
≥3 Prior OPD Visits	19 (61.3%)	26 (27.7%)	0.005*
Parental Education ≥ Graduate	12 (38.7%)	33 (35.1%)	0.71
Urban Residence	20 (64.5%)	61 (64.9%)	0.97

*Statistically significant at $p < 0.05$

Children aged ≥11 years were more likely to be on polypharmacy, with 54.8% of polypharmacy patients being in this age group compared to only 29.8% of those without polypharmacy (p-value = 0.018). A higher proportion of polypharmacy patients (67.7%) had two or more comorbidities, compared to only 12.8% of non-polypharmacy patients (p-value < 0.001). Additionally, those with ≥3 prior outpatient department (OPD) visits were more likely to be on polypharmacy (61.3% vs. 27.7%, p-value = 0.005).

The most commonly prescribed medication categories in this cohort were antipyretics/analgesics, prescribed to 70.4% of the patients, followed by antibiotics (60.0%) and antihistamines/anti-allergics (51.2%). Other notable categories included bronchodilators/inhalers (32.8%) and gastrointestinal agents (17.6%). Psychotropic medications, such as those used for ADHD, were prescribed to 13.6% of the patients, while antiepileptics were prescribed to 19.2%.

Table 3: Distribution of Commonly Prescribed Medication Categories (n = 125)

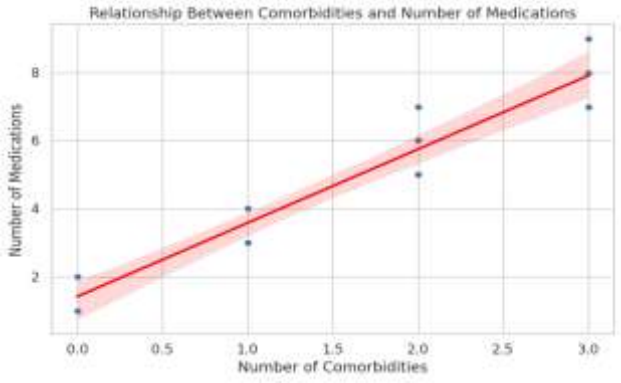
Medication Category	Patients Receiving Medication (n)	Percentage (%)
Antipyretics / Analgesics	88	70.4%
Antibiotics	75	60.0%
Antihistamines / Anti-allergics	64	51.2%
Bronchodilators / Inhalers	41	32.8%
Antiepileptics	24	19.2%
Multivitamins / Supplements	30	24.0%
Psychotropics (e.g. ADHD meds)	17	13.6%
Gastrointestinal agents (e.g. PPIs, antacids)	22	17.6%

Age ≥11 years had an adjusted odds ratio (AOR) of 2.65 (95% CI: 1.13 – 6.21, p-value = 0.024), suggesting that older children are more likely to be prescribed five or more medications. Having ≥2 comorbidities significantly increased the likelihood of polypharmacy, with an AOR of 5.74 (95% CI: 2.18 – 15.11, p-value < 0.001). Similarly, ≥3 prior OPD visits was associated with polypharmacy, with an AOR of 3.41 (95% CI: 1.42 – 8.19, p-value = 0.006). However, parental education and urban residence were not significantly associated with polypharmacy, as indicated by their p-values (0.79 and 0.96, respectively).

Table 4: Multivariate Logistic Regression Analysis of Risk Factors for Polypharmacy

Risk Factor	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Age ≥11 years	2.65	1.13 – 6.21	0.024*
≥2 Comorbidities	5.74	2.18 – 15.11	<0.001*
≥3 Prior OPD Visits	3.41	1.42 – 8.19	0.006*
Parental Education ≥ Graduate	1.12	0.48 – 2.64	0.79
Urban Residence	0.98	0.44 – 2.18	0.96

*Statistically significant at $p < 0.05$



DISCUSSION

This study revealed that approximately one in four pediatric outpatients (24.8%) were exposed to polypharmacy, defined as the concurrent use of five or more medications. This incidence is consistent with emerging global data indicating a steady rise in

pediatric polypharmacy, particularly among children with chronic illnesses and frequent healthcare encounters. While traditionally overlooked in pediatric care, polypharmacy is now recognized as a growing public health concern, with significant implications for drug safety, therapeutic efficacy, and healthcare costs [13]. Our findings demonstrate that older children, particularly those aged 11 years and above, were significantly more likely to be exposed to polypharmacy. This may reflect the transition into adolescence, where behavioral, psychiatric, and endocrine disorders (e.g., ADHD, depression, Type 1 diabetes, PCOS) begin to emerge or intensify, many of which are managed pharmacologically. Moreover, adolescents may be seen by multiple specialists across different domains, contributing to fragmented prescribing and increasing the likelihood of therapeutic overlap [14]. These observations align with previous studies, such as Feudtner et al. (2012), which reported an increased prevalence of complex chronic conditions and associated polypharmacy in older pediatric patients [15].

The most influential predictor of polypharmacy in our study was the presence of multiple comorbidities. Children with two or more chronic conditions were nearly six times more likely to experience polypharmacy, a finding that underscores the direct correlation between disease burden and medication load [16]. This is consistent with prior research by Choonara and Conroy (2002), which emphasized that the complexity of managing multi-system illnesses often necessitates polypharmacy, albeit with increased risk of adverse drug reactions, poor adherence, and reduced quality of life [17]. Furthermore, the growing trend of subspecialty-driven care in tertiary settings may contribute to uncoordinated treatment plans and therapeutic redundancy. Frequent outpatient consultations were also independently associated with polypharmacy in our cohort. Children with three or more OPD visits in the past six months were more than three times as likely to receive five or more medications [18]. This could reflect more severe or persistent symptoms prompting repeated visits, but it may also indicate provider hesitation to deprescribe or the addition of symptomatic medications without adequate reassessment of ongoing therapies [19]. Such a prescribing cascade has been previously described in the literature and raises concerns about the long-term rationality of pediatric medication regimens. Interestingly, socioeconomic variables such as parental education, residence (urban vs. rural), and income level showed no statistically significant relationship with polypharmacy in our study. This contrasts with some earlier studies conducted in high-income countries, where higher parental education and urban settings were sometimes linked to greater awareness and insistence on pharmaceutical management [20]. Our study also identified that antibiotics, antipyretics, antihistamines, and multivitamins were the most frequently prescribed drug classes. While many of these may be short-term, symptomatic prescriptions, the sheer volume in which they are prescribed, often in combination, highlights the need for improved prescribing stewardship in outpatient pediatric care [21]. Psychotropics and antiepileptics, though prescribed less frequently overall, were disproportionately concentrated among polypharmacy cases, which aligns with global concerns regarding long-term safety and monitoring in pediatric neuropsychiatric pharmacology. These findings call for the implementation of robust medication review systems in outpatient clinics, the development of pediatric-specific deprescribing guidelines, and more interdisciplinary communication between treating physicians. Encouraging shared decision-making with caregivers and strengthening primary care continuity could further reduce unnecessary medication use. Importantly, pediatricians must be trained not only to initiate therapy but also to critically assess the ongoing need for each drug at every visit. This study has certain limitations. Being cross-sectional, causality cannot be established. Data were collected from a single center, which may limit generalizability. Moreover, we did not assess clinical outcomes such as adverse drug events or treatment adherence, which could further contextualize the impact of polypharmacy. Despite these limitations, this study provides valuable insight into the prevalence and drivers of polypharmacy in a resource-limited outpatient setting, where data are sparse and oversight systems are often weak.

CONCLUSION

It is concluded that polypharmacy is a prevalent and clinically significant issue among pediatric outpatients, with an incidence rate of 24.8% in our study population. The findings highlight that children aged 11 years and above, those with multiple comorbidities, and those with frequent outpatient visits are at substantially higher risk of being exposed to polypharmacy. These associations underscore the multifactorial nature of pediatric polypharmacy, driven by both clinical complexity and healthcare system practices. While certain medication classes such as antibiotics, antipyretics, and antihistamines are commonly prescribed across the board, the clustering of psychotropic and antiepileptic drugs in polypharmacy cases calls for heightened vigilance in monitoring, follow-up, and dose rationalization.

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