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Research Article

Assessing the Impact of Adherence on the Cost of Illness among Schizophrenia Outpatients

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Abstract
Schizophrenia imposes a significant economic burden on both patients and their families. This study aims to evaluate the costs incurred by outpatient schizophrenia patients and examine their relationship with adherence to monthly hospital visits. An observational study was conducted at the Mental Health Hospital of Lampung Province from February to September 2023, utilizing both primary and secondary data. Primary data were collected through questionnaires assessing direct and indirect costs from the patient's perspective, while secondary data from medical records provided information on patient demographics and hospital visit adherence. To analyse the relationship between sociodemographic variables and patient adherence, a bivariate analysis was performed using the chi square test. Meanwhile, the association between cost variables and adherence was examined using the Mann Whitney U test. The study involved 100 subjects, revealing an average total cost of illness of IDR 258,586 per patient per month or IDR 3,103,032 per year. The mean direct medical cost was IDR 123,774.26, while direct nonmedical costs and indirect costs amounted to IDR 111,277.23 and IDR 22,376.23 per patient, respectively. The analysis indicated a significant association between patient adherence and sociodemographic factors, including insurance status, the presence of a companion, and place of residence. Additionally, the patience adherence—reflected in regular hospital visits—was positively associated with both direct nonmedical costs and total illness costs. These findings suggest that reducing direct nonmedical costs, such as transportation, food, and accommodation, may help lower the overall cost of illness and ultimately improve patient adherence to regular hospital visits.

Keywords: cost of illness, patient adherence, pharmacoeconomics, schizophrenia

Analisis Dampak Kepatuhan Pengobatan terhadap Biaya Penyakit pada Pasien Skizofrenia Rawat Jalan

Abstrak
Skizofrenia menimbulkan beban ekonomi bagi pasien dan keluarga. Penelitian ini bertujuan untuk menilai biaya yang dikeluarkan oleh pasien skizofrenia rawat jalan serta menganalisis hubungannya dengan kepatuhan terhadap kunjungan bulanan ke rumah sakit. Studi observasional dilakukan di Rumah Sakit Jiwa Provinsi Lampung dari Februari hingga September 2023, menggunakan data primer dan sekunder. Data primer dikumpulkan melalui kuesioner yang mengevaluasi biaya langsung dan tidak langsung dari perspektif pasien, sedangkan data sekunder diperoleh dari rekam medis untuk mendapatkan data demografi pasien dan kepatuhan terhadap kunjungan rumah sakit. Hubungan antara variabel sosiodemografi dan kepatuhan pasien dianalisis menggunakan uji chi square. Sementara itu, variabel biaya dan kepatuhan dianalisis menggunakan uji Mann Whitney U. Studi ini melibatkan 100 subjek dan menunjukkan bahwa rerata total biaya penyakit adalah IDR 258.586 per pasien per bulan atau IDR 3.103.032 per tahun. Rerata biaya medis langsung sebesar IDR 123.774,26, sedangkan biaya nonmedis langsung dan biaya tidak langsung masing-masing sebesar IDR 111.277,23 dan IDR 22.376,23 per pasien. Analisis menunjukkan adanya hubungan antara kepatuhan pasien dengan karakteristik sosialdemografi, termasuk metode pembayaran, keberadaan pendamping, dan tempat tinggal. Selain itu, kepatuhan pasien—yang tercermin dari kunjungan rutin ke rumah sakit—berhubungan positif dengan biaya langsung nonmedis dan total biaya penyakit. Temuan ini menunjukkan bahwa pengurangan biaya langsung nonmedis, seperti transportasi, makanan, dan akomodasi, dapat membantu menurunkan total biaya penyakit secara keseluruhan dan pada akhirnya meningkatkan kepatuhan pasien dalam melakukan kunjungan rutin.

Kata Kunci: cost of illness, farmakoekonomi, kepatuhan pengobatan, skizofrenia

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Introduction

Schizophrenia is a severe mental health disorder that significantly contributes to years of life lost due to disability.[1] It affects approximately 24 million people worldwide, with a prevalence of 1 in 300 individuals, increasing to 1 in 222 among adults.[2,3] People living with schizophrenia frequently experience comorbid physical health issues such as infections, hypertension, diabetes mellitus, and obesity, which contribute to a reduced life expectancy of 10 to 20 years.[2–5] Furthermore, schizophrenia is linked to a mortality rate that is 2 to 4 times higher than that of the general population, with suicide affecting an estimated 5% to 10% of those diagnosed.[2,3]

In Indonesia, the prevalence of schizophrenia has fluctuated over the past decade. Basic health research reported an increase from 1.7 per 1,000 households in 2013 to 7 per 1,000 households in 2018. However, by 2023, the prevalence declined to 4%, reflecting the evolving impact of the disorder on public health.[6,7] Despite this decline, access to mental healthcare remains a challenge, with 45.8% of individuals with severe mental disorders not receiving adequate treatment.[6] Stigma, economic barriers, and limited mental health resources further exacerbate these challenges, contributing to delays in treatment and poor patient outcomes.[8–10]

Beyond its clinical consequences, schizophrenia imposes a substantial economic burden on patients, families, and healthcare systems.[2] In 2010, the global cost of mental health disorders was estimated at USD 2.5 trillion, with two-thirds attributed to indirect costs such as lost productivity and caregiving expenses.[11] This figure is projected to rise to USD 6.0 trillion by 2030.[11] In the United States (US), the annual cost of schizophrenia alone is approximately USD 343.2 billion, with 73.4% attributed to indirect costs and 26.6% to direct costs.[2] Similarly, in Italy, the economic burden of schizophrenia amounts to EUR 2.7 billion, with indirect costs comprising 50.5% and direct costs 49.5%.[12] In South Korea, schizophrenia-related expenses total 6.907 billion won, with indirect costs outweighing direct medical expenses.[13]

Despite extensive global research on the economic impact of schizophrenia, data on its financial burden in Indonesia remains limited. However, it is known that only 2.89% of the Ministry of Health's total budget is allocated to mental health programs.[14,15] A study in Indonesia estimated the average annual treatment cost for schizophrenia patients at IDR 3,307,931, covering only direct medical expenses.[16] Another study in Aceh revealed that hospitalization for schizophrenia patients led to economic losses of IDR 12,404,158 per patient per year, highlighting the significant financial strain on families and healthcare facilities.[17]

The rate of nonadherence among schizophrenia patients varies between 5.03% and 58.0%.[18–20] A study at a national mental health hospital in Indonesia reported a nonadherence rate of 60%, with 40% of patients classified as partially nonadherent and 20% as poorly adherent.[21] Additionally, research from the West Java Psychiatric Hospital found that nonadherence among mental health inpatients reached 88%.[22] Several factors contribute to poor adherence, including inadequate family knowledge, financial constraints, medication side effects, stigma, lack of health insurance, and difficulties accessing healthcare services.[20,23]

Given the chronic nature of schizophrenia, adherence to treatment is a crucial factor in minimizing these costs and improving patient outcomes. Studies have shown that low adherence leads to a higher risk of relapse, increased hospitalization rates, and a reduced quality of life.[18,24,25] Additionally, this will

have a significant impact on overall healthcare costs. To assess the financial impact of schizophrenia more comprehensively, cost of illness (COI) analysis is commonly used.[26,27]

This study aims to analyze the COI among schizophrenia outpatients and to examine the relationship between adherence to monthly hospital visits and the associated economic burden. The findings will provide valuable insights into the financial challenges faced by schizophrenia outpatients and their families, offering a reference for policymakers to improve mental health services and patient support systems.

Method

Study design

The research was economic evaluation conducted through analytical observational methods at Mental Health Hospital in Lampung Province at February to September 2023. This study protocol was approved by The Faculty of Medicine Lampung University (9018/UN26.18/PP05.02.00/2022).

Population and sample size

The study population were schizophrenia outpatient or family members who attending mental health hospital in 2022 and the total number of schizophrenia outpatients in that years was 24,935. The sampling in this study used a nonprobability sampling technique with a constitutive sampling method. Sample size was determined using estimated population proportion so the study used 100 samples

The sample were schizophrenia outpatients who met the inclusion and exclusion criteria. Inclusion criteria were schizophrenia outpatients aged more than 18 years and patients or families who were willing to be respondents. However, patients with incomplete medical records and illegible prescriptions were excluded from this.

Data collection

Sociodemographic data and patient attendance records over a six-month period were obtained from medical records. The collected variables included age, sex, education level, occupation, place of residence, and type of insurance.

The COI framework categorizes healthcare expenses into three components: direct costs (e.g., hospitalization, medications, and medical consultations), indirect costs (e.g., lost productivity and caregiver burden), and intangible costs (e.g., reduced quality of life and emotional distress).[16,27,28] However, this study focused solely on direct and indirect costs, excluding intangible costs. Cost data were collected using a structured form that incorporated both hospital records and patient reported expenses, classifying them into three categories: direct medical costs, direct nonmedical costs, and indirect costs.

Direct medical costs included registration fees, hospital services, medications, and laboratory and radiology tests. For insured patients, these expenses were extracted from hospital records, while for out of pocket patients, they were obtained through interviews. Direct nonmedical costs covered transportation, parking, accommodation, and meal expenses for both patients and their companions, with data gathered through interviews with patients and their families. Indirect costs represented income lost due to absenteeism, reflecting productivity losses for both patients and their companions, and were also obtained through interviews.

For patients with chronic conditions such as schizophrenia, particularly those covered by insurance, regular monthly check-ups are recommended to ensure treatment continuity. Consistent hospital attendance is crucial for monitoring treatment progress, adjusting therapy as needed, and preventing

complications.[23] A widely accepted method for measuring adherence is analysing pharmacy refill data from medical records, which assesses a patient's consistency in attending scheduled hospital visits.[29,30] In this study, adherence was defined as attending all scheduled hospital visits for six consecutive months. Patients who missed even a single visit within this period were classified as nonadherent.

Data analysis

Statistical analysis was performed using SPSS. Cost of illness was calculated using the formula:

Direct Medical Cost + Direct Nonmedical Cost +Indirect Cost

A bivariate analysis was conducted using a chi-square test to examine the association between patients' adherence and sociodemographic factors. Nevertheless, the association between patient adherence and variable cost was analyzed using the Mann Whitney U test. In this study, a p value of less than 0.05 was deemed to be statistically significant.

Results

In this study, 103 samples were initially obtained; however, only 100 met the inclusion criteria. Three samples were excluded due to participants' refusal to participate. All 100 included samples had complete medical records, making them the final sample size for analysis (Figure 1).

The Demographic characteristics of the schizophrenia outpatients are summarized in Table 1. The results show that the majority of patients were male (65%), aged between 18–44 years (74%) and insured (92%). Most patients were accompanied by a family member (78%), were unemployed (61%) and had completed secondary school (44%). In addition, 31% of patients were residents of Bandar Lampung. It was also found that 63% of patients had attended the hospital for six consecutive months, while 37% had not.

Further analysis revealed that approximately 63%, 44%, and 25% of the samples had insurance, had visited the hospital with a companion, and resided in Bandar Lampung, respectively. These factors demonstrated a statistically significant association ($p<0.05$) with adherence to the recommendation of visiting the hospital for six consecutive months (Table 1).

Table 2 presents the mean costs for outpatients with schizophrenia. The mean direct medical cost is IDR 123,774.26 per patient, the direct nonmedical cost is IDR

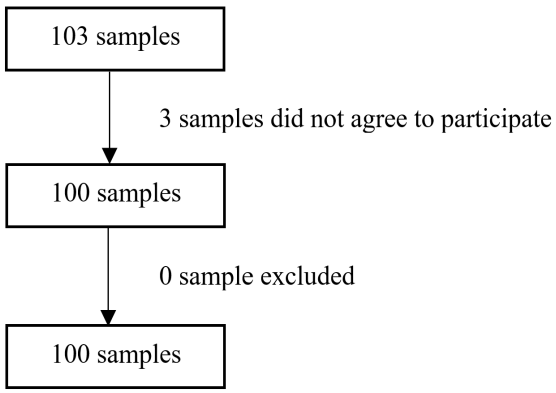

Figure 1 The Number of Participants in This Study

111,277.23 per patient, and the indirect cost is IDR 22,376.23 per patient. Additionally, the overall mean cost of illness is IDR 258,586 per patient per month, which amounts to IDR 1,551,516 per patient over six months or IDR 3,103,032 per patients annually. In this study, health costs were dominated by direct medical costs at 47.92% and followed by direct nonmedical costs at 43.41%. Meanwhile, indirect costs have a proportion

Table 1 Demographic Characteristics of The Schizophrenia Outpatients

Variable	6 Consecutive months attendance		p-Value
	Adherence (n=63)	Nonadherence (n=37)	
Sex			
Female	23	12	0.680
Male	40	25	
Age			
18–44	48	26	0.534
45–59	13	8	
60	2	3	
Insurance			
Insurance	63	29	**<0.001***
No insurance	0	8	
Companion			
Companion	44	34	**0,010***
No Companion	19	3	
Occupation			
Employed	26	13	0.544
Unemployed	37	24	
Education Level			
Elementary school	14	11	
Junior high school	13	7	0.210
Senior high school	26	18	
Undergraduate	10	1	
Residence			
Bandar lampung	25	6	
Lampung Selatan	11	12	
Pesawaran	9	4	
Pringsewu	9	3	**0.047***
Tanggamus	6	3	
Lampung Timur	1	4	
Lampung Tengah	1	3	
Pesisir Barat	1	1	
Tulang Bawang	0	1	
Patients			
Present	52	30	0.855
Nonpresent	11	7	
Total of medicine			
Less than or 3 medicines	26	16	0.847
More than 3 medicines	37	21	

Note: *p-value < 0.05 was considered statistically significant

Table 2 Cost of Illness per Patient with Schizophrenia Disease

Variable	Mean	SD	Min	Max	Percentage (%)	Total Cost (%)
Direct Medical Cost						
Registration Fee	Rp 10,000.00	Rp 0.00	Rp 10,000.00	Rp 10,000.00	8.07	
Medical Services	Rp 25,000.00	Rp 0.00	Rp 25,000.00	Rp 25,000.00	20.17	
Nursing Services	Rp 10,000.00	Rp 0.00	Rp 10,000.00	Rp 10,000.00	8.07	
Laboratory/Radiology	Rp 0.00	Rp 0.00	Rp 0.00	Rp 0.00	0.00	
Medicine	Rp 78,926.00	Rp 76,506.89	Rp 14,000.00	Rp 542,600.00	63.69	
TOTAL	**Rp 123,926.00**	**Rp 76,506.89**	**Rp 59,000.00**	**Rp 587,600.00**	**100.00**	**47.92**
Direct Nonmedical Cost						
Transportation	Rp 77,665.00	Rp 110,024.52	Rp 10,000,00	Rp 600,000.00	69.18	
Parking Fee	Rp 3,570.05	Rp 2,543.51	Rp 0.00	Rp 7,000.00	3.18	
Meal	Rp 23,775.00	Rp 46,466.04	Rp 0.00	Rp 400,000.00	21.18	
Accommodation	Rp 7,000.00	Rp 28,444.52	Rp 0.00	Rp 150,000.00	6.23	
Cigarettes	Rp 250.00	Rp 1,760.25	Rp 0.00	Rp 13,000.00	0.22	
TOTAL	**Rp 112,260.00**	**Rp 159.835,16**	**Rp 10,000.00**	**Rp 1,157,000.00**	**100.00**	**43.41**
Indirect Cost						
Patient Missed workdays	Rp 6,800.00	Rp 24,438.34	Rp 0.00	Rp 120,000.00	30.09	
Patient companions' missed workdays	Rp 15,800.00	Rp 63,439.78	Rp 0.00	Rp 500,000.00	69.91	
TOTAL	**Rp 22,600.00**	**Rp 73,076.27**	**Rp 0.00**	**Rp 500,000.00**	**100.00**	**8.74**
Cost of Illness	**Rp 258.586,00**	**Rp 228.489,47**	**Rp 79.000,00**	**Rp 1.744.600,00**		**100.00**

Table 3 Association Between 6 Consecutive Months Attendance with the Cost of Schizophrenia Outpatient

Variable	Mean (IDR)		p Value
	Adherence	Nonadherence	
Direct Medical Cost	129,580.95	114,297,30	0.410
Direct Nonmedical Cost	91,476.19	147,648.65	0.026*
Indirect Cost	15,793.65	34,189.19	0.266
Cost of Illness	**236,850.79**	**296,145.13**	**0,049***

Note: *p-value < 0.05 was considered statistically significant

of 8.74%.

Notably, a significant association was observed between patient adherence to regular hospital visits and both direct nonmedical costs and the overall cost of illness, as presented in Table 3. Bivariate analysis revealed a p value of less than 0.05, indicating a significant association between these variables.

Discussion

The findings of this study indicate that adherence to monthly patient visits is significantly associated with both direct nonmedical costs and the overall cost of illness. Additionally, several sociodemographic factors—including insurance status, the presence of a treatment companion, and the patient's home address—were also found to influence adherence to routine care.

Adherence to monthly visits is a widely used proxy for assessing medication adherence in patients with chronic conditions such as schizophrenia.[23,29,30] In this study, 37% of patients were identified as nonadherent over a six-month period. This figure is notably lower than those reported in previous studies from East Java and West Java psychiatric hospitals, which recorded nonadherence rates of 60% and 88%, respectively.[21,22] One key factor contributing to this discrepancy is the method used to assess adherence. For example, one study used a self-report adherence scale,[21] whereas this study relied on hospital visit records. Although this method allows for retrospective analysis, easy data retrieval, population segmentation, and longitudinal assessment of adherence and persistence, it does not confirm actual medication intake. Patients may refill prescriptions without consistently taking the medication at home.[29,30]

Nonadherence is recognized as a major contributing factor to relapse in patients with schizophrenia—a condition characterized by the recurrence of previous symptoms, often requiring rehospitalization.[31,32] Relapse in schizophrenia patients is reflected in repeated hospitalisations, drug resistance, progressive damage to brain structures, personal distress, difficulties in the patients' rehabilitation process, anxiety, lack of knowledge and the emergence of treatment side effects.[32] These outcomes highlight the urgency of addressing nonadherence as a critical concern in schizophrenia management, which has led many researchers to focus on this issue as a primary target for intervention.[30,33,34]

This study also found that insurance status, home address, and lack of a treatment companion were associated with increased relapse risk. These findings align with previous research suggesting that companions play a vital role in supporting patient adherence, both through emotional encouragement and logistical assistance.[35,36]

Schizophrenia is a complex psychiatric disorder that significantly impairs cognitive, emotional, and behavioral functioning. Patients often experience demotivation due to the repetitive nature of treatment, making the support of family members essential for maintaining medication routines and overall well-being.[35,36]

Moreover, the study found that patients with insurance coverage were more likely to adhere to treatment regimens. This aligns with earlier research demonstrating that lower out of pocket costs are associated with better adherence, particularly for chronic conditions requiring long-term treatment.[37–41] In contrast, patients without insurance face higher financial burdens, which can hinder regular access to care.[37,38,41] Additionally, geographical factors such as the patient's distance from the treatment facility contribute to increased costs, particularly for transportation and accommodation, which can further deter treatment adherence.[39–42]

Although most patients in this study were unemployed and incurred no direct income loss, the presence of a treatment companion was common. The indirect costs borne by companions—primarily through lost income—represented a significant financial burden. While many studies have identified indirect costs as the largest component of the economic burden of schizophrenia.[2,12,13] our findings align with a Spanish study indicating that direct costs may outweigh indirect costs, and with a US study suggesting that both cost categories impose similar burdens.[43] In our study, indirect costs were limited to income lost by patients and companions during treatment. Costs related to family caregiving and other intangible burdens were not assessed, potentially underestimating the full economic impact of schizophrenia.[16,27,28]

Schizophrenia arises from the interplay of biological vulnerabilities and environmental stressors, with unemployment being a major cyclical factor: the illness contributes to joblessness, and joblessness exacerbates the illness.[3,44,45] This pattern of unemployment was strongly represented in our patient sample.

The largest share of direct medical costs was not borne by patients themselves; 92% received care funded by national health insurance. However, direct nonmedical costs—especially transportation, which constituted 43.41% of total nonmedical costs—remained a major financial burden, particularly for those living in rural or remote areas. Economic factors, including employment, income, and insurance status of both patients and their families, significantly affect access to and continuity of care.[34,38,39,41] Several qualitative studies have also highlighted transportation as a prominent barrier to treatment adherence, particularly in low-income populations.[32,42] Families may spend up to IDR 600,000 per treatment visit, a cost that rises with distance and disproportionately affects those living in remote regions. In such cases, transportation expenses compete directly with basic needs such as food, shelter, and education, particularly in low-income households.[39,41]

Indonesia's national health system includes a Back Referral Program (Program Rujuk Balik), which allows patients with chronic but stable conditions, including schizophrenia, to continue receiving medication at primary healthcare centers with specialist approval.[46,47] This program aims to enhance cost efficiency and treatment accessibility, particularly by reducing indirect costs such as transportation expenses, which are often linked to patient adherence.[48] However, a study from Jember found that its implementation for schizophrenia patients remains limited and inconsistent, highlighting challenges in its effectiveness.[49]

Economic evaluation through cost estimation plays a crucial role in assessing

the broader impact of schizophrenia, informing both clinical and policy decisions. This study provides valuable insights into direct and indirect costs but does not account for intangible costs, such as quality of life or caregiver burden. Additionally, it relies on hospital visit records as a proxy for adherence, which may not fully reflect actual medication use. Future research should incorporate more comprehensive adherence metrics and a broader range of cost factors to provide a more accurate understanding of the total economic burden of schizophrenia. Moreover, further studies are needed to evaluate the implementation of the Back Referral Program for schizophrenia patients, particularly its effectiveness in improving adherence and reducing healthcare costs.

Conclusion

The estimated mean cost of illness for schizophrenia inpatients is IDR 258,586 per patient per month, totaling IDR 1,551,516 over six months and IDR 3,103,032 annually. Among these expenses, direct medical costs represent the largest proportion. However, association analysis reveals that patient adherence to hospital visits significantly affects both the total cost of illness and direct nonmedical costs. Notably, transportation, accommodation, and food comprise a substantial share of the direct nonmedical costs.

Schizophrenia is one of the conditions covered by the Back Referral Program. Implementing and optimizing this program for schizophrenia patients can be an effective strategy to reduce the overall cost of illness, particularly in minimizing direct nonmedical expenses. However, the extent to which this program has been implemented and its effectiveness for schizophrenia patients remain unclear. Future research will need to look at how this program can be implemented as a way of reducing the burden associated with direct nonmedical costs.

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Conflict of Interest

The authors declare no conflict of interest in this study.

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