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Biopsychosocial and Environmental Determinants of Toddler Health Service Utilization in Kediri City, Indonesia

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ABSTRACT

Aims Utilization of child health services through routine visits to community health posts (Posyandu) is essential for growth monitoring, immunization, and disease prevention among toddlers. This study aimed to analyze the biopsychosocial and household environmental determinants of health service utilization among toddlers in Kediri City, Indonesia.

Instrument & Methods This cross-sectional study was conducted among 515 toddlers selected through random sampling. Data were collected using a validated and reliable structured questionnaire administered to the toddlers' mothers. Data were analyzed using chi-square tests and multivariable logistic regression.

Findings Of 515 toddlers, 406 (78.8%) routinely attended Posyandu, while 109 (21.2%) attended nonroutinely. Most mothers were aged ≥36 years (90.3%), had completed antenatal care (72.8%), and were multiparous (65.0%); BPJS enrollment and access to health information were reported by 81.7% and 85.4% of respondents, respectively. Significant associations were found between service utilization and parental age and education, antenatal care history, parity, maternal malnutrition, pregnancy complications, and comorbidities ($p \leq 0.020$). After adjustment, several individual, healthcare, and household factors remained significant predictors, and the model explained 68.7% of the variance in utilization (Nagelkerke $R^2=0.687$).

Conclusion Toddler health service utilization is influenced by multiple biopsychosocial and environmental factors.

Keywords Health; Health Services; Environment; Indonesia

CITATION LINKS

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Introduction

The use of health services for infants and toddlers, particularly regular visits to community-based integrated health posts (Pos Pelayanan Terpadu, or Posyandu), is a key component of a primary health care system focused on health promotion and disease prevention. Posyandu posts facilitate growth monitoring, early detection of health problems, and the provision of basic interventions for infants and toddlers at the community level [1, 2]. Despite their important role, Posyandu utilization varies across regions and socioeconomic groups, suggesting that factors beyond service availability influence the use of child health services [3, 4].

Globally, low utilization of child health services has been associated with household environmental conditions and socioeconomic circumstances. Studies have shown that children living in households with poor sanitation, exposure to secondhand smoke, and limited access to clean water are less likely to use preventive health services [5, 6]. These challenges are often compounded by inadequate financial protection and low health literacy among families [7]. Consequently, the utilization of child health services cannot be separated from the environmental and socioeconomic contexts in which children are raised.

In Indonesia, Posyandu remains the backbone of primary health services for infants and toddlers at the village and subdistrict levels. Although national Posyandu coverage is relatively high, routine attendance among infants and toddlers remains suboptimal, particularly in densely populated urban settings and areas facing environmental challenges [1]. Previous studies have reported that families living in unhealthy household environments are less likely to attend Posyandu regularly, highlighting the influence of household environmental conditions on health service utilization [8, 9]. Exposure to secondhand smoke is one of the most common environmental health issues in Indonesian households. In addition to its direct adverse effects on child health, secondhand smoke may also reflect lower levels of health awareness within families [10, 11]. Studies have demonstrated that households with smokers tend to exhibit less favorable health-seeking behaviors, which may influence parents' decisions to use Posyandu services for their children [12].

Basic sanitation conditions, including access to clean water and adequate toilet facilities, are also important determinants of child health. Poor sanitation increases the risk of infectious diseases and may hinder the utilization of preventive health services [13, 14]. Evidence indicates that families with adequate access to clean water are more likely to use preventive health services than those with limited access, suggesting that household environmental quality plays an important role in health service utilization [15]. Socioeconomic factors further influence access to and utilization of health services. Health insurance coverage through BPJS has been shown to improve access to primary health care, including services for children [16, 17]. However, insurance coverage alone may not guarantee optimal service utilization in the absence of supportive household environmental conditions [18]. Therefore, environmental and socioeconomic determinants should be examined simultaneously to better understand patterns of child health service utilization [19, 20]. Household environmental exposures can influence health care–seeking behavior, including attendance at community health services, depending on the social context [21]. This highlights the complexity of how infectious diseases influence family health behaviors.

The socioecological approach provides a useful framework for understanding health service utilization among infants and toddlers.

This perspective emphasizes that health behaviors are shaped by interactions among individual, household, community, and health system factors [22, 23].

In the context of Posyandu, the socioecological model helps explain how environmental and socioeconomic conditions influence families' decisions regarding the utilization of child health services [24]. Although previous studies have identified environmental and socioeconomic determinants of maternal and child health behaviors [25, 26], most have focused primarily on health outcomes, such as stunting or infectious diseases, rather than on health service utilization itself. Furthermore, few studies have simultaneously examined biological, psychological, social, and environmental determinants within a single analytical framework. Addressing this gap is important for developing more effective interventions to improve child health service utilization.

This study aimed to analyze the biopsychosocial and environmental determinants of health service utilization among toddlers in Kediri City using a socioecological approach. Specifically, the study examined biological factors (maternal and paternal age and education), psychological factors (antenatal care history, parity, maternal malnutrition during pregnancy, history of multiple pregnancies, and comorbidities), social factors (parental occupation, BPJS coverage, and access to health information), and household environmental factors (housing density, ventilation, building materials, waste management, exposure to secondhand smoke, distance to the toilet, and access to clean water). The findings are expected to provide evidence for developing community- and environment-based interventions to improve the sustainable utilization of child health services.

Instrument and Methods

Design and sample

This quantitative, cross-sectional study was conducted in Kediri City, Indonesia.

The sample consisted of all toddlers residing in Kediri City, Indonesia, in 2025, totaling 2,926 toddlers. The required sample size was determined using the Slovin formula with a 4% margin of error:

$$n=\frac{N}{1+Ne^2}=\frac{2926}{1+2926\,(0.04)^2}=\frac{2926}{5.6814}=514.98\approx515$$

In this formula, n=required sample size, N=population size (2,926 toddlers), e=margin of error (0.04). Therefore, the minimum required sample size was 515 toddlers. Participants were selected using simple random sampling to ensure that each eligible toddler had an equal probability of being included in the study.

Data collection

Participation was voluntary, and informed consent was obtained from all respondents before data collection. Personal identifiers were removed from the dataset to ensure confidentiality and anonymity in accordance with ethical principles for health research.

Instrument

Primary data were collected using a structured questionnaire developed by the researchers based on the Indonesian Ministry of Health's guidelines for maternal and child health services and a literature review on the determinants of health service utilization. The questionnaire was administered to mothers of toddlers and consisted of five sections.

The first section collected data on the respondents' biological characteristics, including maternal age, paternal age, maternal educational level, and paternal educational level. All data were collected using closed-ended questions and measured on nominal or ordinal scales, depending on the characteristics of each parameter. The second section assessed psychological factors and maternal health history, including antenatal care (ANC) history, parity, chronic energy deficiency (CED) during pregnancy, pregnancy complications, and comorbidities. Data were collected through closed-ended questions with "Yes" or "No" response options based on the respondents' health histories. The third section assessed social factors, including maternal occupation, paternal occupation, National Health Insurance (BPJS) enrollment, and access to health information.

Access to health information was assessed based on the respondents' exposure to information from health workers, mass media, and digital media. The fourth section assessed household environmental conditions, including housing density, home ventilation, building materials, household waste management, exposure to secondhand smoke indoors, the distance from the house to the toilet, and access to clean water. Household environmental conditions were assessed using sanitation indicators based on the Indonesian Ministry of Health's environmental health standards. The fifth section assessed the study outcome, namely, toddler health service utilization through Posyandu visits. This was assessed based on the frequency of Posyandu visits during the previous 12 months and categorized as routine or nonroutine according to the Posyandu program guidelines. Whenever available, information on Posyandu attendance was verified using the Maternal and Child Health (MCH) Handbook or Posyandu attendance records to minimize recall bias.

Before data collection, the questionnaire underwent content validation by three experts in public health and maternal and child health. A pilot study was subsequently conducted among 30 respondents whose characteristics were similar to those of the study population. The validity test showed that all questionnaire items had an item–total correlation coefficient of ≥0.2, confirming their validity. The reliability test demonstrated a Cronbach's alpha coefficient of ≥0.7 for each questionnaire domain, indicating good internal consistency. Therefore, the questionnaire was considered suitable for use in the study.

Statistical analysis

All collected data were coded and entered into a database for statistical analysis. Data were analyzed using SPSS 23. Bivariate analysis was performed using the chi-square test to examine the associations between the predictor parameters and toddler health service utilization through Posyandu visits. Parameters with statistically significant associations in the bivariate analysis were entered into a multivariable logistic regression model to identify independent determinants of toddler health service utilization.

Findings

Most mothers (90.3%) and fathers (98.4%) were aged ≥36 years. In addition, the majority of mothers (67.2%) and fathers (74.6%) had received formal education (Table 1).

Table 1. Frequency of biological characteristics of the respondents (n=515)

Parameter	Frequency (%)
Mother's age (year)	
<36	50 (9.7)
≥36	465 (90.3)
Father's age (year)	
<36	8 (1.6)
≥36	507 (98.4)
Mother's education level	
Illiterate	169 (32.8)
Literate	346 (67.2)
Father's education level	
Illiterate	131 (25.4)
Literate	384 (74.6)

Most mothers had completed their antenatal care visits (72.8%) and were multiparous (65.0%). The majority reported no history of maternal malnutrition during pregnancy (78.4%), pregnancy complications (94.0%), or comorbid conditions (99.2%).

Most mothers were unemployed (63.3%), whereas nearly all fathers were employed (98.8%). The majority of respondents were enrolled in BPJS (81.7%) and had access to health information (85.4%). These results indicate that most mothers were unemployed, whereas most fathers were employed, and that most respondents had BPJS coverage and access to health information (Table 2).

Table 2. Frequency of psychological and social characteristics of the respondents (n=515)

Parameter	Frequency (%)
Mother's antenatal care history	
Complete	375 (72.8)
Incomplete	140 (27.2)
Mother's parity history	
Primipara	180 (35.0)
Multipara	335 (65.0)
Grande multipara	0 (0.0)
History of maternal malnutrition during pregnancy (KEK)	
No	404 (78.4)
Yes	111 (21.6)
History of pregnancy complications	
No	484 (94.0)
Yes	31 (6.0)
History of concomitant medical conditions	
No	511 (99.2)
Yes	4 (0.8)
Mother's occupation	
Employed	189 (36.7)
Unemployed	326 (63.3)
Father's occupation	
Employed	509 (98.8)
Unemployed	6 (1.2)
BPJS enrollment	
Yes	421 (81.7)
No	94 (18.3)
Access to health information	
Yes	440 (85.4)
No	75 (14.6)

Most households had adequate ventilation (75.0%), tile flooring (62.5%), brick walls (50.9%), and access to waste collection services (51.1%). Most respondents reported no exposure to cigarette smoke inside the home (62.3%), had a toilet located within 10 meters of the house (53.2%), and had access to clean water (79.4%; Table 3).

Of the 515 toddlers included in the study, 406 (78.8%) attended Posyandu routinely, whereas 109 (21.2%) attended nonroutinely.

Significant associations were observed between toddler health service utilization and all biological factors, including maternal age (p=0.001), paternal age (p=0.002), maternal education (p=0.020), and paternal education (p=0.006). Significant associations were also found for psychological factors, including antenatal care history (p<0.001), parity (p<0.001), a history of maternal malnutrition during pregnancy (p=0.007), pregnancy complications (p=0.009), and comorbid conditions (p=0.008; Table 4).

Table 3. Household environmental characteristics of the respondents (n=515)

Parameter	Frequency (%)
Housing density	
Low	253 (49.1)
High	262 (50.9)
Home ventilation	
Adequate	386 (75.0)
Inadequate	129 (25.0)
Floor type	
Tile	322 (62.5)
Cement or dirt	193 (37.5)
Wall type	
Brick	262 (50.9)
Wood or wattle-and-daub	253 (49.1)
Waste management	
Collected	263 (51.1)
Burned	252 (48.9)
Exposure to cigarette smoke	
No	321 (62.3)
Yes	194 (37.7)
Distance of toilet from home (meters)	
<10	274 (53.2)
≥10	241 (46.8)
Access to clean water	
Yes	409 (79.4)
No	106 (20.6)

Table 4. Bivariate analysis of factors associated with toddler health service utilization

Parameter	Odds ratio	p-Value
Biological factors		
Mother's age	0.355	0.001
Father's age	1.116	0.002
Mother's education level	1.452	0.020
Father's education level	1.557	0.06
Psychological factors		
Mother's antenatal care history	2.551	<0.001
Mother's parity history	0.416	<0.001
History of pregnancy with KEK	0.966	0.007
History of concomitant pregnancy	0.888	0.009
History of concomitant medical conditions	1.271	0.008
Social factors		
Mother's occupation	0.614	0.025
Father's occupation	1.879	0.003
BPJS enrollment	16.567	<0.001
Access to health information	10.234	<0.001
Household environmental		
Housing density	2.001	0.002
Home ventilation	3.157	<0.001
Floor type	2.908	<0.001
Wall type	4.174	<0.001
Waste management	4.216	<0.001
Exposure to cigarette smoke	3.878	<0.001
Distance of toilet from home	4.448	<0.001
Access to clean water	5.000	<0.001

Significant predictors of toddler health service utilization included maternal age, paternal education, antenatal care history, parity, BPJS enrollment, access to health information, housing density, home ventilation, floor type, wall type, waste management, exposure to cigarette smoke, and access to clean water (Table 5). In contrast, paternal age, maternal education, a history of maternal malnutrition during pregnancy, pregnancy

complications, comorbid conditions, maternal occupation, paternal occupation, and toilet distance from the house were not significantly associated with toddler health service utilization after adjustment for the other parameters ($p>0.05$). The logistic regression model yielded a Nagelkerke R^2 value of 0.687, indicating that the parameters included in the model explained 68.7% of the variation in toddler health service utilization, whereas the remaining 31.3% was attributable to factors not included in the model.

Table 5. Multivariable logistic regression analysis of factors associated with toddler health service utilization

Parameter	Adjusted odds ratio	95% CI	p-Value
Biological factors			
Mother's age	0.20	0.07-0.57	0.002
Father's age	1.36	0.65-0.82	0.415
Mother's education level	1.65	0.69-3.98	0.263
Father's education level	4.03	1.36-11.97	0.012
Psychological factors			
Mother's antenatal care history	7.03	3.09-16.03	<0.001
Mother's parity history	0.20	0.09-0.45	<0.001
History of pregnancy with KEK	1.30	0.54-3.12	0.553
History of concomitant pregnancy	0.90	0.22-3.66	0.882
History of concomitant medical conditions	5.79	0.01-0.10	0.999
Social factors			
Mother's occupation	0.59	0.28-1.23	0.161
Father's occupation	0.93	0.09-11.26	0.958
BPJS enrollment	8.08	3.08-21.17	<0.001
Access to health information	6.60	2.31-18.90	<0.001
Household environmental			
Housing density	2.11	1.04-4.26	0.038
Home ventilation	2.56	1.22-5.38	0.013
Floor type	2.05	1.03-4.10	0.042
Wall type	1.18	4.66-26.79	<0.001
Waste management	4.95	2.23-10.98	<0.001
Exposure to cigarette smoke	3.06	1.49-6.27	0.002
Distance of toilet from home	1.54	0.74-3.21	0.251
Access to clean water	2.88	1.25-6.63	0.013

Discussion

This study examined the biopsychosocial and environmental determinants of toddler health service utilization through Posyandu visits in Kediri City. Health service utilization among toddlers was influenced by a combination of biological, psychological, social, and household environmental factors, supporting the socioecological perspective that health behaviors are shaped by multiple interacting determinants.

Biological factors, particularly parental age and education, were associated with toddler health service utilization. Most parents were 36 years or older and had received formal education. Older parents generally possess greater life experience, maturity, and decision-making capacity regarding family health matters [27]. Likewise, parental education is an important social determinant of health because it influences health literacy, access to information, and understanding of the benefits of preventive health care services. Parents with higher educational attainment are more likely to utilize child health care services and engage in health-promoting behaviors [28, 29].

Paternal education remained a significant predictor of Posyandu utilization, highlighting the importance of fathers' educational attainment in supporting child health-seeking behavior. In many households, fathers continue to play a central role in financial decision-making and the allocation of household resources, including health care–related expenditures. Higher educational attainment among fathers may therefore facilitate a better understanding of the long-term benefits of preventive child health services and increase support for routine Posyandu attendance. Furthermore, educated fathers are more likely to encourage shared decision-making with their spouses, seek reliable health information, and prioritize investments in child health. This interpretation is supported by previous evidence showing that fathers with higher educational levels tend to have greater awareness of preventive health care and are more likely to support access to child health services through appropriate financial and health-related decisions [30]. This observation underscores the need for interventions aimed at improving toddler health service utilization to target not only mothers but also fathers through family-centered health education and community-based health promotion programs.

Psychological factors also played an important role. Mothers with a history of complete ANC utilization were more likely to utilize Posyandu services for their children. ANC provides opportunities for health education, counseling, and ongoing interaction with health care providers, which may increase awareness of the importance of monitoring child growth and development after birth [31]. Similar findings have been reported showing that positive maternal experiences with health care services during pregnancy are associated with greater utilization of child health services [32]. Parity was also significantly associated with Posyandu utilization. Mothers with previous childbirth experience may have greater confidence and knowledge regarding their children's health needs, enabling them to recognize the importance of regular health monitoring for toddlers [33, 34]. Similarly, maternal knowledge, positive attitudes toward Posyandu, and prior exposure to health education have been shown to increase participation in community-based child health services, whereas inadequate knowledge and limited motivation remain important barriers to utilization [30]. These findings can be interpreted within the continuum of maternal and child health care, whereby health care utilization during pregnancy influences subsequent health-seeking behaviors after childbirth. Mothers who regularly attended ANC are more likely to establish trusting relationships with health care

providers, receive consistent counseling, and become familiar with community-based services such as Posyandu. Consequently, improving the quality and continuity of ANC services may strengthen long-term engagement with the health care system and encourage the continued utilization of preventive child health services throughout early childhood.

Social determinants emerged as some of the strongest predictors of health service utilization. In particular, BPJS enrollment showed the strongest association with routine Posyandu attendance in the multivariable analysis. Thus, financial protection remains a critical factor influencing health care utilization. Health insurance reduces economic barriers to accessing healthcare and increases families' willingness to seek preventive and promotive health services when needed. Health insurance coverage improves access to maternal and child health care services and reduces inequalities in health care utilization [35].

Access to health information was another important determinant. Families who receive health information from health care providers, Posyandu cadres, social media, or mass media are more likely to understand the benefits of preventive health care and participate in community-based health programs. Consistent with previous findings, adequate health information promoted health awareness and encourages appropriate health care–seeking behavior [36]. These findings are consistent with recent evidence from Indonesia showing that participation in the National Health Insurance (JKN/BPJS) program significantly increases the utilization of primary health care services by reducing financial barriers and improving access to essential health care, particularly among vulnerable populations. Similarly, individuals covered by JKN are more likely to utilize preventive health care services, highlighting the importance of financial protection in promoting participation in community-based health programs.

Access to health information was another important determinant, as families who receive information from healthcare providers, Posyandu cadres, or mass and digital media are more likely to understand the benefits of preventive health care and utilize community-based health services. Adequate health information enhances health literacy and encourages appropriate health care–seeking behavior, enabling parents to make informed decisions regarding child growth monitoring and preventive health care utilization [37, 38]. The strong influence of BPJS enrollment and access to health information is consistent with Andersen's Behavioral Model of Health Services Use, which identifies health insurance and health information as key enabling resources for health care utilization. Together, financial protection and health literacy help families overcome economic and informational barriers, thereby promoting routine participation in Posyandu and other community-based child health services. These findings emphasize the importance of integrating universal health insurance expansion with comprehensive health promotion strategies to improve child health service utilization.

Household environmental conditions were also significantly associated with toddler health service utilization. Families living in healthier environments characterized by adequate ventilation, improved housing materials, proper waste management, no exposure to cigarette smoke, and access to clean water were more likely to utilize Posyandu services. Environmental conditions influence both children's health status and families' perceptions regarding the importance of preventive health care. A healthy household environment is associated with lower exposure to infectious diseases and greater adoption of clean and healthy living behaviors [39]. Conversely, environmental risks, such as poor sanitation, inadequate housing conditions, and exposure to cigarette smoke, may increase children's health vulnerabilities and influence health care–seeking practices.

BPJS enrollment, ANC history, access to health information, waste management, exposure to cigarette smoke, and several housing-related variables remained significant predictors of toddler health service utilization after adjustment for other factors. Hence, healthcare utilization is not determined by a single factor but rather by the interaction of individual, family, social, and environmental influences. The results support previous evidence that maternal and child health service utilization is shaped by a complex combination of socioeconomic resources, health care accessibility, health knowledge, and environmental conditions [32].

The prominent role of BPJS enrollment can be interpreted using Andersen's Behavioral Model of Health Services Use, which identifies health insurance as a key enabling factor that facilitates health care utilization by reducing financial barriers. In the Indonesian context, BPJS not only reduces out-of-pocket health care expenditures but also promotes continuity of preventive and promotive services through Posyandu and primary health care facilities, thereby supporting equitable access to maternal and child health services, particularly among vulnerable households. Furthermore, the regression model explained a substantial proportion of the variability in toddler health service utilization, indicating that health care–seeking behavior is influenced by multiple interrelated determinants. The significant contributions of antenatal care history, access to health information, housing conditions, waste management, exposure to cigarette smoke, and access to clean water support biopsychosocial and socioecological perspectives,

which emphasize that health behavior results from the interaction of biological, behavioral, social, and environmental factors [40]. These findings highlight the need for integrated, multisectoral interventions that combine expanded BPJS coverage, strengthened maternal and child health education, improved access to reliable health information, and healthier household environments to increase routine Posyandu utilization and improve child health outcomes.

This study has several limitations. First, the cross-sectional design allows only for the identification of associations and does not establish causal relationships between the studied parameters and toddler health service utilization. Second, the data were collected using self-reported questionnaires, which may be subject to recall bias, particularly regarding ANC history, pregnancy complications, comorbidities, and Posyandu attendance. Social desirability bias may also have influenced respondents' answers. Despite these limitations, the study's major strength lies in its comprehensive assessment of biological, psychological, social, and environmental determinants within a single analytical framework. This approach provides a broader understanding of the factors influencing Posyandu utilization and may support the development of more integrated child health policies and interventions.

The multivariable analysis identified paternal education, antenatal care history, parity, BPJS enrollment, access to health information, housing density, home ventilation, floor type, wall type, waste management, exposure to cigarette smoke, and access to clean water as significant determinants of Posyandu utilization. Among these factors, BPJS enrollment showed the strongest association with routine utilization of toddler health services.

These findings highlight the importance of adopting a comprehensive approach that addresses health care access, health education, and household environmental conditions to improve Posyandu attendance and child health outcomes.

Efforts to increase Posyandu utilization should focus on strengthening BPJS enrollment, improving access to health information, enhancing maternal and child health education, and promoting healthy household environments through improved sanitation, access to clean water, and tobacco smoke control. Collaboration among the health, education, social, and environmental sectors is needed to support sustainable improvements in child health service utilization.

Future studies should employ longitudinal or mixed-methods designs to better understand causal relationships and explore additional determinants, such as family support, the role of Posyandu cadres, health care service quality, sociocultural influences, and geographic accessibility.

Conclusion

Toddler health service utilization through Posyandu is influenced by multiple biological, psychological, social, and household environmental factors.

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Authors' Contribution: Nugraheni R (First Author), Introduction Writer/Methodologist/Main Researcher/Discussion Writer/Statistical Analyst (70%); Suhartono DR (Second Author), Assistant Researcher/Discussion Writer (10%); Sutikno E (Third Author), Assistant Researcher/Discussion Writer (10%); Astutik WS (Fourth Author), Methodologist/Assistant Researcher/Discussion Writer (10%)

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