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Determinants of Congenital Hypothyroidism Screening Implementation among Mothers with Newborns

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Abstract

The incidence of congenital hypothyroidism (CH) in Indonesia was estimated to be as high as 1 in 1,500 live births, significantly higher than in neighbouring countries such as Singapore, Malaysia, and Vietnam. However, despite efforts by the Ministry of Health to implement CH screening as part of maternal and child health services, the program's national coverage remains limited. This study aimed to identify factors influencing congenital hypothyroidism screening (CHS) implementation among mothers with newborns. The study was conducted at the Sekarwangi Health Center area, Sukabumi Regency, in 2023. This cross-sectional study used proportional random sampling to collect data from 291 respondents. Univariate, bivariate, and multivariate analyses were performed. Bivariate analysis showed that only the mother's occupation, time, and distance to healthcare facilities significantly influenced CHS implementation ($p<0.05$). Multivariate analysis revealed that the variables of occupation ($p=0.016$, PR=3.433), income ($p=0.045$, PR=2.348), marital status ($p=0.023$, PR=7.720), and accessibility of healthcare facilities (distance) ($p<0.001$, PR=2.055) were significant. Based on the analysis, accessibility to healthcare facilities (distance) was the most dominant factor influencing CHS implementation among newborns, followed by the variables of occupation, income, and marital status. Improving access to healthcare services is necessary, such as through the provision of mobile healthcare programs and digital-based education, to expand the coverage of screening.
Keyword: congenital hypothyroidism screening, demographics, knowledge, family support

Penentu Implementasi Skrining Hipotiroidisme Kongenital di Kalangan Ibu dengan Bayi Baru Lahir

Abstrak

Kejadian hipotiroid kongenital (HK) di Indonesia diperkirakan mencapai 1 dari 1.500 kelahiran hidup, secara signifikan lebih tinggi daripada di negara-negara tetangga seperti Singapura, Malaysia, dan Vietnam. Meskipun ada upaya Kementerian Kesehatan untuk menerapkan skrining hipotiroid kongenital (SHK) sebagai bagian dari layanan kesehatan ibu dan anak, cakupan nasional program tetap terbatas. Penelitian ini bertujuan untuk mengetahui faktor-faktor yang berpengaruh terhadap pelaksanaan SHK pada ibu yang memiliki bayi baru lahir. Penelitian ini dilakukan di wilayah kerja Puskesmas Sekarwangi Kabupaten Sukabumi pada tahun 2023. Penelitian ini menggunakan desain cross-sectional dan sampling acak proporsional untuk mengumpulkan data dari 291 responden. Data dianalisis menggunakan analisis univariat, bivariat, dan multivariat. Hasil analisis bivariat menunjukkan bahwa hanya variabel pekerjaan ibu, waktu tempuh, dan jarak ke fasilitas kesehatan yang berpengaruh terhadap pelaksanaan SHK ($p<0.05$). Hasil analisis multivariat mendapatkan p value *variabel pekerjaan p=0,016, PR=3.433 (1.261-9.352), variabel pendapatan p=0,045, PR=2.348 (1.020-5.405), status perkawinan p=0,023, PR=7.720 (1.324-45.027), variabel Keterjangkauan akses fasilitas kesehatan (jarak) p= <-0.001 dengan PR= 2.055 (1.428-2.957). Hasil analisis menunjukkan bahwa variabel keterjangkauan akses fasilitas kesehatan (jarak) merupakan faktor dominan yang mempengaruhi pelaksanaan SHK pada bayi baru lahir, diikuti oleh variabel pekerjaan, pendapatan, dan status perkawinan. Upaya peningkatan akses layanan kesehatan diperlukan, seperti pengadaan program layanan kesehatan keliling dan edukasi berbasis digital, untuk memperluas cakupan skrining.*
Kata Kunci: *skrining hipotiroid kongenital, demografi, pengetahuan, dukungan keluarga*

Introduction

Congenital hypothyroidism (CH) is a metabolic disorder characterised by the underproduction or complete absence of thyroid hormones from birth. This condition results from anatomical abnormalities, metabolic disturbances in hormone synthesis, or iodine deficiency (Kemenkes RI 2019). As thyroid hormones are essential for normal physical and cognitive development, early detection and treatment are critical to preventing irreversible complications such as growth retardation and intellectual disabilities. Newborn CH screening has been widely recognised as an effective public health measure for identifying affected infants early, enabling timely intervention to ensure optimal developmental outcomes. (Presetyowati 2015).

In Indonesia, the incidence of CH is estimated to be as high as 1 in 1,500 live births, significantly higher than in neighbouring countries such as Singapore, Malaysia, and Vietnam (Kemenkes RI 2019). However, despite efforts by the Ministry of Health to implement CH screening as part of maternal and child health services, the program's national coverage remains limited. In 2023, CH screening coverage reached only 28% of newborns, far below the target of 45% (Noflidaputri and Meilinda, 2021). In West Java, Sukabumi Regency reported a coverage rate of 43.8%, with significant disparities between regions. Notably, the Sekarwangi Health Center in Cibadak district recorded the lowest coverage, with only 7.8% of newborns screened. (Kemenkes RI 2023)). This discrepancy underscores the need for targeted interventions to address barriers to CH screening implementation.

The challenges in CH screening uptake are multifaceted. A lack of maternal awareness about CH and its long-term impacts remains a significant barrier. Many mothers decline the screening for their newborns due to an insufficient understanding of its purpose and benefits. (Feld et al. 2018). Socioeconomic factors, including family income, maternal education, and accessibility to healthcare facilities, further influence the decision to participate in screening programs (Veisani et al. 2014). Additionally, logistical challenges, such as the availability of skilled healthcare workers and proper facilities, exacerbate the issue. (Pulungan et al. 2024). In Sukabumi Regency, initial observations suggest that these challenges are compounded by limited outreach and inadequate communication from healthcare providers, particularly at the Sekarwangi Health Center.

Globally, studies have shown that maternal knowledge and attitudes are critical in improving CH screening uptake. For example, mothers with higher education levels and positive perceptions of the screening process are likelier to participate. (Mahgoub et al. 2022). Furthermore, healthcare workers' effective health communication and education can significantly influence maternal decision-making. (Presetyowati 2015). In Sukabumi Regency, early observations indicate that low maternal awareness, inadequate family support, and limited healthcare outreach significantly contribute to the underperformance of CH screening programs. Specifically, at Sekarwangi Health Center, many mothers have expressed reluctance to participate in the program due to insufficient information provided during antenatal visits. Addressing these gaps requires a comprehensive understanding of the determinants influencing maternal decision-making and participation in CH screening.

This study investigates the socio-economic and healthcare access factors influencing CH screening uptake among mothers with new-borns at the Sekarwangi Health Center area. By identifying key determinants such as maternal occupation, income, marital status, and accessibility of healthcare facilities, this research seeks to provide actionable insights for policymakers and healthcare providers. Ultimately, enhancing CH screening coverage will contribute to better child health outcomes, reducing the burden of preventable disabilities on families and the broader healthcare system.

Method

This study employed a cross-sectional analytic design to examine factors influencing the uptake of Congenital Hypothyroidism Screening (CHS) among mothers with newborns at Sekarwangi Health Center, Sukabumi Regency, Indonesia, in 2023. Independent variables included maternal demographics (age, education, occupation, income, marital status), knowledge, family support, maternal and newborn health conditions, and accessibility to health services (time, cost, and distance). The dependent variable was CHS implementation.

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The study involved 291 respondents selected using proportional random sampling from five villages and one urban neighbourhood within the Sekarwangi Health Center area. Inclusion criteria included mothers with newborns in 2023 who resided in the study area, could read and write, and agreed to participate through informed consent. Data collection was conducted using structured questionnaires covering demographics, knowledge, family support, health conditions, and access to healthcare services.

Ethical approval for this study was obtained with number 12/KEPK/FITKes-Unjani/IX/2024). Participants were ensured confidentiality and anonymity; no personally identifiable information was recorded in the analysis. Data were collected through home visits, health posts, and the health centre between September and November 2024.

Statistical analysis was performed using IBM SPSS version 25. Univariate analysis was conducted to describe the frequency and percentage distribution of categorical variables, as well as the mean and standard deviation for numerical variables that met normality assumptions. Normality of numerical data was tested using the Kolmogorov–Smirnov test. Bivariate analysis examined the association between independent and dependent variables. For categorical variables, Chi-square tests were applied, with the assumption that the expected frequency in each cell was ≥5; if this assumption was not met, Fisher's Exact test was used as an alternative. Multivariate logistic regression was then performed to identify dominant factors influencing CHS uptake. Logistic regression was selected because the dependent variable (implementation of CHS: yes/no) was dichotomous, and independent variables consisted of categorical and numerical predictors. The results were presented as prevalence ratios (PR) with 95% confidence intervals (CI).

Result and Discussion

Table 1. Demographic characteristics of participants (n=291)

Variable	n	%
Congenital hypothyroid screening		
Yes	197	67.7
No	94	32.3
Age		
Non-risk	245	84.2
Risk	46	15.8
Occupation		
employed	251	86.3
unemployed	40	13.7
Level of education		
Primary	72	24,7
Secondary	202	69,4
Tertiary	17	5,8
Income		
Below	236	81.1
Above	55	18.9
Marital status		
Single women	7	2.4
Married	284	97.6
Knowledge		
Low	36	12.4
Adequate	176	60.5
Good	79	27.1
Family support		
Unsupportive	129	44.3
Supportive	162	55.7
Maternal health history		
No history of	279	96.2
History of	11	3.8
Prematurity		
Premature	107	36.8
Full term	184	63.2
Health facility access (time)		
<15 minute	93	32
15-30 minute	126	43,3
>30 minute	72	24,7
Health facility access (cost)		
<Rp.50.000	166	57
Rp.50.000-Rp.100.000	77	26,5
>Rp100.000	48	16,5
Health facility access (distance)		
<3 km	108	37,1
3-5 km	115	39,5
>5 km	68	23,4

The majority of respondents (67.7%, n=197) had their newborns screened for congenital hypothyroidism. Most respondents (84.2%, n=245) were in the non-risk age group. Regarding employment, a significant portion of respondents (86.3%, n=251) were unemployed or homemakers. Regarding educational background, the majority (69.4%, n=202) had completed secondary education. Concerning family income, most respondents (81.1%, n=236) reported earnings below the regional minimum wage (UMR). As for

marital status, nearly all respondents (97.6%, n=284) were married during childbirth.

Regarding knowledge, most respondents (60.5%, n=176) had moderate knowledge about congenital hypothyroidism screening. Family support for screening was also significant, with over half of the respondents (55.7%, n=162) receiving family support to carry out the screening. As for prematurity, most respondents (63.2%, n=184) delivered their babies at full term. Regarding healthcare accessibility, nearly half of the respondents (43.3%, n=126) had a travel time of 15-30 minutes to the nearest healthcare facility. Regarding transportation costs, the majority (57%, n=166) spent less than Rp 50,000, and most respondents (35.95%, n=115) travelled 3-5 kilometres to the facility.

Table 2. Determinant Factors Associated with Congenital Hypothyroidism Screening (CHS) Implementation (n=291)

Variable	Congenital hypothyroid screening						PR (95% CI)	p-value
	No		Yes		Total			
	F	%	F	%	F	%		
Age								
Non-risk	77	25.6	168	57.7	245	84.2	0.782 (0.405-1.508)	0.537
Risk	17	5.8	29	10	46	15.8		
Occupation								
employed	88	30.2	163	56.0	251	86.3	3.059 (1.237-7.568)	0.019*
unemployed	6	2.1	34	11.7	40	13.4		
Level of education								
Primary	20	6.9	52	17.9	72	24.7	-	0.074
Secondary	67	23	135	46.4	202	69.4		
Tertiary	7	2.4	10	3.4	17	5.8		
Income (minimum wage)								
Below	82	28.2	154	52.9	236	81.1	1.908 (0.953-3.818)	0.092
Above	12	4.1	43	14.8	55	18.9		
Marital status								
Single women	4	1.4	3	1	7	2.4	2.874 (0.630-13.11)	0.218
Married	90	30.9	194	66.7	284	97.6		
Knowledge								
Low	15	5.2	21	7.2	36	12.4	-	0.122
Adequate	49	16.8	127	43.6	176	60.5		
Good	30	1.3	49	16.8	79	27.1		
Family support								
Unsupportive	49	16.8	80	27.5	129	44.3	1.592 (0.971-2.611)	0.085
Supportive	45	15.5	117	40.2	162	55.7		
Maternal health history								
No history of	90	31	189	65.2	279	96.2	1.270 (0.329-4.9)	1.000
History of	4	1	8	2.8	12	3.8		
Prematurity								
Premature	34	11.7	73	25.1	107	36.8	0.963 (0.578-1.604)	0.987
Full term	60	20.6	124	42.6	184	63.2		
Health facility access (time)								
< 15 minute	34	11.7	59	20.3	93	32		0.012*
15-30 minute	47	16.2	79	27.1	126	43.3		
>30 minute	13	4.5	59	20.3	72	24.7	-	
Health facility access (cost)								
< Rp. 50.000	53	18.2	113	38.8	166	57		0.334
Rp.50.000-Rp. 100.000	29	10	48	16.5	77	26.5		
>Rp. 100.000	12	4.1	36	12.4	48	16.5	-	
Health facility access (distance)								
< 3 km	42	14.4	66	22.7	108	37.1		0.001*

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Variable	Congenital hypothyroid screening						PR (95% CI)	p-value
	No		Yes		Total			
	F	%	F	%	F	%		
3-5 km	43	14.8	72	24.7	115	39.5		
>5 km	9	3.1	59	20.3	68	23.4	-	

Abbreviations: PR, odds ratio; CI, confidence interval; * indicates statistically significant result at p < 0.05

Table 3. Multivariate Logistic Regression Analysis of risk factors of CHS

Variable	B	P value	PR (95% CI)
Occupation	1.234	0.016	3.433 (1.261-9.352)
Income	0.854	0.045	2.348 (1.020-5.405)
Marital status	2.044	0.023	7.720 (1.324-45.027)
Health facility access (distance)	0.720	<0.001	2.055 (1.428-2.957)

Abbreviations: PR, odds ratio; CI, confidence interval

Bivariate analysis revealed no significant association between maternal age and the implementation of congenital hypothyroidism screening (CHS). Among mothers in the non-risk age group, 84.2% (n=245) participated in CHS, with a p-value of 0.537 (p>0.05). The prevalence ratio (PR) was 0.782 (95% CI: 0.405–1.508), indicating that age was not a risk factor for CHS implementation. Regarding employment status, 56.0% (n=163) of unemployed mothers participated in CHS, while 30.2% (n=88) did not. A significant association was found between employment and CHS implementation, with a p-value of 0.019 (p<0.05). The PR was 3.059 (95% CI: 1.237–7.568), suggesting that employed mothers were three times more likely to implement CHS than those not employed. For educational background, 17.2% (n=50) of mothers with basic education, 23.0% (n=67) with secondary education, and 2.7% (n=8) with higher education did not participate in CHS. The p-value of 0.074 (p>0.05) indicated no significant association between education and CHS implementation. The absence of a PR suggests that education level was not an important risk factor for CHS implementation. In terms of income, 28.2% (n=82) of mothers with income below the regional minimum wage (UMR) did not participate in CHS, while only 4.1% (n=12) of those with income above UMR did not participate. The p-value of 0.092 (p>0.05) suggested a lack of significant association between income and CHS implementation. The PR of 1.908 (95% CI: 0.953–3.818) indicated a higher likelihood of participation in CHS among mothers with higher incomes.

Bivariate analysis revealed no significant association between maternal knowledge and the implementation of congenital hypothyroidism screening (CHS). Among mothers with inadequate knowledge, 5.2% (n=15) did not participate in CHS, while 16.8% (n=49) of those with moderate knowledge and 10.3% (n=30) of those with good knowledge did not participate. The p-value of 0.122 (p>0.05) indicated no significant relationship between knowledge and CHS implementation. The absence of a prevalence ratio (PR) suggests that knowledge was not a risk factor for implementing CHS among mothers in the Sekarwangi Health Center area, Sukabumi Regency, in 2023.

Bivariate analysis on family support revealed that 16.8% (n=49) of mothers without family support did not participate in congenital hypothyroidism screening (CHS), while 15.5% (n=45) of those receiving family support also did not participate. The p-value of 0.085 (p>0.05) indicated no significant association between family support and CHS implementation. The prevalence ratio (PR) was 1.592 (95% CI: 0.971–2.611), suggesting that family support was not a risk factor for the implementation of CHS among mothers in the Sekarwangi Health Center area, Sukabumi Regency, in 2023.

Maternal health history showed that 31% (n=90) of mothers without a health history did not participate in congenital hypothyroidism screening (CHS). In comparison, only 1% (n=4) of those with a health history failed to participate. The p-value of 1.000 (p>0.05) indicated no significant association between maternal health history and CHS implementation. The prevalence ratio (PR) was 1.270 (95% CI: 0.329–4.9), suggesting that maternal health history was not a risk factor for

CHS implementation among mothers in the Sekarwangi Health Center area, Sukabumi Regency, in 2023. Regarding prematurity, 11.7% (n=34) of mothers with preterm babies did not participate in CHS, while 20.6% (n=60) of those with full-term babies did not participate. The p-value of 0.987 (p>0.05) indicated no significant relationship between prematurity and CHS implementation. The PR was 0.963 (95% CI: 0.578–1.604), suggesting that prematurity was not a risk factor for the implementation of CHS among mothers in the Sekarwangi Health Center area, Sukabumi Regency in 2023.

The accessibility of healthcare facilities revealed that 11.7% (n=34) of mothers with travel time to the facility of less than 15 minutes did not participate in congenital hypothyroidism screening (CHS), while 16.2% (n=47) of those with a travel time of 15–30 minutes and 4.5% (n=13) of those with more than 30 minutes of travel time failed to participate. The p-value of 0.012 (p<0.05) indicated a significant association between travel time and CHS implementation, suggesting that travel time to healthcare facilities was a risk factor for CHS uptake among mothers in the Sekarwangi Health Center area, Sukabumi Regency, in 2023. Regarding the cost of accessing healthcare facilities, 11.7% (n=34) of mothers with expenses less than Rp 50,000 did not participate in CHS, 19.2% (n=56) of those with costs between Rp 50,000–Rp 100,000, and 4.1% (n=12) of those with expenses exceeding Rp 100,000 failed to participate. The p-value of 0.334 (p>0.05) indicated no significant association between costs and CHS implementation, suggesting that access costs were not a risk factor for CHS uptake in this study. For the distance to healthcare facilities, 14.4% (n=42) of mothers living less than 3 km away from the facility did not participate in CHS, 15.1% (n=44) of those living between 3–5 km away, and 2.7% (n=8) of those living more than 5 km away did not participate. The p-value of <0.001 (p<0.05) indicated a significant association between distance to healthcare facilities and CHS implementation, highlighting that the distance to healthcare facilities was a risk factor for CHS uptake among mothers in the Sekarwangi Health Center area, Sukabumi Regency, in 2023.

Table 7 results from the multivariate analysis showed that occupation (p=0.016, PR=3.433, CI: 1.261-9.352), income (p=0.045, PR=2.348, 1.020-5.405), and marital status (p=0.023, PR=7.720, CI: 1.324-45.027) were significantly associated with congenital hypothyroidism screening. However, the variable of affordability of healthcare access (distance) was the most significant factor (p<0.001, PR=2.055, CI: 1.428-2.957), indicating that proximity to healthcare facilities was the dominant determinant of screening implementation.

Impact Demographic characteristics with CHS among study participants.

This study evaluated the determinants of Congenital Hypothyroidism Screening (CHS) implementation at Sekarwangi Health Center, Sukabumi Regency. Based on univariate, bivariate, and multivariate analyses, it was found that 67.7% of mothers participated in CHS. This indicates a relatively good awareness of the importance of early detection of congenital hypothyroidism, although 32.3% of mothers have not yet attended. his study evaluated the relationship between maternal demographic characteristics age, education level, employment status, family income, and marital status and the implementation of Congenital Hypothyroidism Screening (CHS) in the service area of Sekarwangi Health Center, Sukabumi Regency. Bivariate analysis revealed that among the demographic variables analysed, only maternal employment status had a significant association with CHS implementation (p = 0.019).

The analysis of factors influencing CHS implementation for newborns revealed several noteworthy findings. Maternal age did not significantly impact CHS implementation, aligning with the findings of (Semmler et al. 2017). Maternal employment status emerged as a significant factor, with unemployed mothers more likely to participate in CHS. This finding is supported by studies from (Mweemba et al. 2021), highlighting time constraints as a barrier for employed mothers to access healthcare services. Education level showed a positive trend toward CHS implementation, although it was not statistically significant. This aligns with (Setiyani, Sukesi, and Esyuananik 2016), who noted that higher education levels improve health awareness. Similarly, family income exhibited a similar trend without statistical significance, consistent with findings from (Hussein et al. 2024). Lastly, marital status did not significantly influence CHS implementation, in line with (Mai et al. 2023). These findings suggest that socioeconomic factors, such as employment and income, substantially

influence CHS implementation more than demographic factors like age and marital status. Unemployed mothers and those with higher incomes were likelier to participate in CHS, indicating that access to healthcare services and time flexibility are crucial determinants in deciding to screen newborns. This aligns with the Health Belief Model, which emphasises the importance of external factors, such as accessibility, in shaping health behaviour. Although education demonstrated a positive trend toward CHS implementation, its impact was not statistically significant. (Bakry et al. 2024). This indicates that other factors, such as social support and healthcare systems, play critical roles beyond knowledge.

Impact Knowledge with CHS among study participants.

The analysis revealed that mothers' knowledge of congenital hypothyroidism screening did not have a significant impact on the implementation of SHK, with a p-value of 0.122. Specifically, although most mothers had adequate or good knowledge of SHK, there was no significant difference in the level of SHK implementation between mothers with poor, adequate, or sound knowledge. While knowledge is a crucial factor in the decision to perform screening, these results indicate that knowledge alone is insufficient to motivate mothers to carry out SHK. Adequate or good knowledge does not necessarily translate into direct action, especially if other factors, such as access to healthcare facilities or family support, are not conducive to implementation. This aligns with the research by (Rose et al. 2006), which stated that although maternal knowledge is important, the success of health programs is often influenced by other social factors, such as family support and the availability of easily accessible healthcare facilities. This can be explained using the Health Belief Model (HBM), which posits that although an individual's knowledge and perception of health risks and benefits play a role in decision-making, other factors such as practical barriers (e.g., time, cost, accessibility) and social support also play a significant role in motivating individuals to act. (Mahgoub et al. 2022). This model explains that even if someone is aware of the importance of preventive actions, they may not carry them out if barriers hinder them, such as limited access to healthcare facilities or lack of family support.

Impact family support with CHS among study participants

Family support showed a significant association with implementing congenital hypothyroidism screening (SHK) (p-value 0.085). Mothers who received family support were likelier to carry out SHK than those who did not. Family support, particularly from partners or other family members, significantly influenced mothers' decisions to undergo health procedures such as screening. The researchers argue that emotional and practical family support facilitates mothers' access to healthcare services for SHK implementation. Mothers who feel socially and practically supported are more motivated to follow health procedures for their baby's well-being. This is in line with the findings by (Pilon et al. 2021), who found that strong family support, especially from husbands or other family members, played a crucial role in the successful implementation of infant health screening, as this support alleviated the burden on mothers in terms of time and logistics for accessing healthcare facilities. Family support, encompassing emotional, practical, and informational aspects, plays a vital role in mothers' decisions to implement congenital hypothyroidism screening (SHK). Recent research suggests that strong family support can reduce stress and improve mothers' mental well-being, which in turn contributes to better decision-making in accessing healthcare services. Social support serves as a primary resource in coping with stress. This support helps mothers to evaluate stress more positively and effectively, thus improving their mental well-being, which is crucial in implementing preventive measures such as CHS (Al-Mutawtah et al. 2023).

Impact Maternal health history with CHS among study participants.

The analysis revealed no statistically significant relationship between maternal health history and CHS implementation (PR = 1.270, 95% CI: 0.329–4.9, p = 1.000). Mothers without a history of illness (96.2%) were likelier to participate in CHS than those with a history of illness (2.8%). This trend may reflect higher preventive health awareness among healthier mothers, who often focus more on their children's health than their conditions. (Jackson et al. 2015) (Park et al. 2020) Support this finding, emphasising

that lower perceived personal health risks correlate with greater engagement in preventive health behaviours. Similarly, prematurity did not significantly affect CHS implementation (PR = 0.963, 95% CI: 0.578–1.604, p = 0.987). Among premature infants (36.8%), only 25.1% underwent CHS, compared to 42.6% of full-term infants. Despite the clinical risks associated with prematurity, such as higher vulnerability to thyroid dysfunction, barriers like limited maternal knowledge and accessibility challenges may hinder screening efforts. Studies by Park et al. (2018) and Brown et al. (2021) highlighted the emotional stress and lack of education as key obstacles for mothers of premature infants. Overcoming psychological and logistical barriers is crucial to improving CHS uptake in this high-risk group. (Parkes, Sweeting, and Wight 2015).

This trend aligns with findings from (Joshi et al. 2024), which suggests that healthier mothers prioritise preventive health measures for their children. According to the Health Belief Model (HBM), individuals are more likely to engage in preventive behaviours if they perceive a higher benefit and lower barriers. Mothers without personal health burdens may have a greater capacity to focus on preventive measures, perceiving CHS as a critical step for their child's health. Further, lower perceived personal health risks correlate with proactive health behaviours, including CH.

Impact Health facility access with CHS among study participants

Travel time to healthcare facilities was significantly associated with CHS implementation (p = 0.012). Mothers with less than 15 minutes of travel time were more likely to participate in CHS (27.1%) than those requiring over 30 minutes (4.5%). Shorter travel times enhance accessibility, facilitating preventive healthcare services like CHS. This finding aligns with studies by (Coombs, Campbell, and Caringi 2022), which emphasised that long travel times are a significant barrier, particularly in rural areas, while shorter times increase participation in neonatal screening programs. While most mothers who participated in CHS incurred transportation costs under Rp 50,000 (38.8%), there was no statistically significant relationship between transportation costs and CHS implementation (p = 0.334). This lack of significance may reflect the impact of healthcare subsidies or free services in certain areas. A previous study highlighted that national health insurance programs could mitigate financial barriers, reducing their influence on preventive health behaviour. Additionally, perceived benefits often outweigh financial costs, mainly when subsidies are available. (Hanson et al. 2022)

Distance to healthcare facilities significantly correlated with CHS implementation (p = 0.001). Mothers living within 3 km of a facility had higher CHS participation rates (22.7%) than those living more than 5 km away (3.1%). Closer proximity improves accessibility and increases the likelihood of mothers utilising health services. Previous studies corroborate this finding, demonstrating that geographical proximity is crucial in service utilisation, especially in areas with limited transportation infrastructure. These findings underscore the importance of geographical and financial accessibility in increasing CHS coverage. Efforts to improve proximity to healthcare facilities, reduce travel time, and provide financial support through subsidies are vital to enhancing participation in preventive health programs. (Evans et al. 2022).

Dominant factors influencing the implementation of CHS

Distance is critical in accessing healthcare services, particularly for preventive measures like CHS. Shorter distances to healthcare facilities are associated with better utilisation, as supported by Noor et al. (2020), who emphasised that geographical proximity enhances healthcare accessibility. The PRECEDE-PROCEED model underscores the importance of enabling factors such as proximity in promoting health behaviours. Limited access due to distance can delay or prevent the utilization of essential health services, highlighting the need for targeted interventions, such as mobile health units or improved transportation systems. (Handajani, Pamungkasari, and Budihastuti 2018). Employment status significantly affects maternal decisions regarding health services. Employed mothers often exhibit greater independence and financial resources, enabling them to prioritize their children's health. This is consistent with (Mahgoub et al. 2022), which notes that working mothers have increased access to information and are more empowered in decision-making. According to Social Control Theory, individuals with more resources and

autonomy are better positioned to use preventive health measures. However, time constraints employed mothers face can sometimes limit their ability to access health services, requiring flexible service delivery options.

Income remains a crucial enabler in accessing healthcare services. Higher family income allows mothers to overcome barriers such as transportation costs and lost wages. The findings are in line with (Kilwanila et al. 2021), which highlighted the role of financial resources in enhancing healthcare utilization. Andersen's Behavioral Model of Health Services Use also emphasizes that financial resources are key determinants of healthcare accessibility. Policymakers must mitigate financial constraints through subsidies or free healthcare services, especially for low-income families. Marital status reflects social and emotional support availability, significantly influencing health-related decisions. (Laksono et al. 2021) Married mothers often benefit from spousal support, facilitating better decision-making regarding preventive health behaviours. The Health Belief Model posits that such reinforcing factors, including emotional and informational support, are essential in motivating individuals to act on health recommendations. In the context of CHS, family dynamics and spousal involvement cannot be overstated, suggesting the need for family-centered health education initiatives.

The most dominant factor influencing the implementation of congenital hypothyroidism screening (CHS) among newborns was the accessibility of healthcare facilities based on distance. This highlights the importance of strengthening geographic accessibility by establishing closer healthcare facilities or mobile health services. Additionally, occupation, income, and marital status significantly impacted, indicating that educational efforts and policy interventions should consider socioeconomic factors and family support to increase screening coverage. Further research is needed to explore other potential factors, such as maternal education and the availability of health information.

Conclusion

This study demonstrated that the implementation of congenital hypothyroidism screening (CHS) at Sekarwangi Health Center reached a coverage rate of 67.7% in 2023. The findings revealed that accessibility to healthcare facilities (distance), maternal occupation, income, and marital status were the primary determinants of CHS uptake among mothers with newborns. These results indicate that socioeconomic conditions and geographic accessibility play a crucial role in maternal decision-making regarding newborn screening. Improving CHS coverage requires targeted interventions addressing socioeconomic barriers and health service accessibility. Policymakers and healthcare providers should prioritise strategies to reduce geographic and financial obstacles, particularly for mothers living far from healthcare facilities or with limited income.

It is necessary to strengthen access to healthcare services by providing mobile health programs and digital-based health education to reach underserved communities. In addition, family-centred health promotion and community empowerment programs should be developed to enhance awareness, support maternal decision-making, and ultimately increase the uptake of congenital hypothyroidism screening.

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