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Timeliness of Congenital Hypothyroidism Screening Services in the Work Area Period of January – March 2024

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Abstract
Introduction: *Early detection and treatment of congenital hypothyroidism can reduce the risk of intellectual disability, so the timeliness of services is the key to the success of the congenital hypothyroidism (SHK) screening program in newborns.* ***Objective:*** *Evaluate the implementation of the SHK program for newborns in the work area of the Sampang Regency Health Office in January - March 2024.* ***Method:*** *Data on the timeliness of collection, specimen delivery to the laboratory and feedback data on screening results were collected through program records and reporting at health service facilities, the Sampang Regency Health Office, and the Dr. Soetomo Surabaya Clinical Pathology Laboratory.* ***Result and Discussion:*** *The timeliness of specimen collection in January was 484 (47.21%) specimens taken on time in February 298 (34.33%), March 436 (45%) of several babies who underwent SHK every month. The category of Too early (24-hour <) in January, February, and March was 221 (21.56%), 373 (42.97%), and 198 (20.43%) respectively. The timeliness of specimen delivery in January was 187 (18%) late specimens. The total number of unreadable specimens (reject) was 515 (18%) out of 2,862 SHK specimens sent to dr. Soetomo Laboratory.* ***Conclusion:*** *The timeliness of SHK sampling at the age of <24 hours (Too Early) was the highest in February, which was 373 (42.97%). The highest specimen delivery delay was in January 187 (18%). The most unreadable/uncheckable SHK papers (Reject) in March 193 (20%)*
Keyword: Blood; Congenital Hypothyroidism Screening; Timeliness Service;

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Introduction

Congenital hypothyroidism (HK) is one of the causes of mental retardation in children that can be prevented if it is known and treated early. Thyroid hormones play a role in the development of the central nervous system (migration and myelination, among others) (Yati et al., 2017). It is known that 95% of HK does not show typical clinical signs and symptoms at birth and the duration of early intervention to prevent short mental retardation. Therefore, most developed countries have carried out neonatal screening programs for early detection of HK (IDAI, 2017) in (Muharis & Triani, 2024).

Worldwide the prevalence of HK is estimated to be close to 1:3000. Congenital hypothyroidism (SHK) screening is very necessary to detect HK disease early because clinical symptoms have not yet appeared in newborns. Hypothyroid symptoms are not easy to recognize, so it is important for newborns to be screened for congenital hypothyroidism so that it does not have fatal consequences. (Permenkes, 2014), (Prasetyowati & Ridwan, 2015). RSCM shows that the incidence of congenital hypothyroidism in 2000-2014 from 213,669 newborns screened for congenital hypothyroidism, a positive result of 85 babies or 1:2513 shows that this number is higher than the global ratio of 1:3000 (IDAI, 2017). If the number of child births in Indonesia reaches 5 million/year, there are more than 2000 newborns suffering from congenital hypothyroidism per year and will accumulate every year (Latifah, Asturiningtas, Nurkahyani, Asher, & AMP;. The achievement of the Sampang Regency SHK program in 2023 is 4,343 babies out of a total of 15,905 live births (27.3%), and there are 647 (14.89%) SHK that are illegible/*Rejection.*

Research data in Indonesia shows that as many as 70% of congenital hypothyroid diagnoses are only known in children over 1 year old. HK-related brain disorders that are detected late are *irreversible* (Yasmin, 2022). Children with HK born to mothers with normal thyroid do not show symptoms at birth. Therefore, it is very important to carry out HK screening on all newborns. If this congenital hypothyroidism can be detected as early as possible, hormone replacement therapy can be given immediately (Kurniawan, 2020)

The right therapy before the child is 1 month old, can prevent damage that occurs so that the child's growth and development can be optimal like other healthy children. In its implementation, SHK is carried out by taking blood samples on the heels of babies who are at least 48 to 72 hours old and a maximum of 2 weeks by health workers at health service facilities providing Maternal and Child Health services (both FKTP and FKRTL), as part of essential neonatal services (Muharis & Triani, 2024)

With this understanding of the importance of SHK, it is hoped that the coverage of congenital hypothyroid screening will increase and more children will receive optimal treatment as early as possible (Radhia, Asmawati, & Rahmawati, 2023). The strategy is to detect severe HK as early as possible, Disability caused by primary HK is mostly because the patient does not receive therapy before the age of 3 months (Indonesia Paediatrician Association, 2017).

This research is more focused on the provider side (health service providers) because the essence of a good service system will increase community participation in the program. The research aims to analyse the obstacles and problems in the implementation of SHK which focuses on the timeliness of services and figures *Rejection* which is quite high (Anggraini, Patria, & Julia, 2017)

Method

A descriptive evaluation study with a retrospective method will be carried out in August 2024. The population of this study is all newborns living in the work area of the Sampang Regency Health and Family Planning Office (Dinkes-KB) for the period from January to March 2024 (Quarter I). The research sample is all newborns who participated in the SHK program at health service facilities (Fasyankes) in the Sampang Regency Health Office-KB work area in January-March 2024 (Quarter I). The SHK Implementing Health Facilities in Sampang Regency consist of 2 Government Hospitals (RSMZ and Ketapang Hospital), 1 Private Hospital, 2 Private Clinics and 21 Health Centers. SHK specimens taken from newborns were collected at the Sampang Regency Health and Family Planning Office (Dinkes-KB). Data related to the source of input for the SHK program, namely trained personnel, as well as explanations related to the timeliness of the services researched were obtained from information provided by health workers implementing the program as well as document review and observations to health facilities.

The data taken, namely the timeliness of specimen collection and delivery, as well as the reporting of unreadable SHK test results (*reject*) collected through document review, merger and processing of program reporting data. The source of the data is the reporting data on the results of laboratory examinations obtained from the Sampang Regency Health and Family Planning Office (Dinkes-KB). The data was analyzed descriptively and presented in the form of percentages.

Result and Discussion

Result

The SHK program in Sampang Regency has been running since 2022. There are 26 health facilities that have implemented this program to date. Input factors such as funds, facilities, and trained personnel are also important factors in the success of a program. Based on the results of the research, in each health facility implementing the SHK program, there are at least 2 representatives of health workers from each health facility who have participated in training related to the SHK program in August 2023. Details of the number of newborns recorded following SHK in Sampang Regency in January, February, and March 2024 are 1025 (90.70%) of the total live births of 1,130 people, 868 (68.61%) of the total live births of 1,265 people, and 969 (73.35%) of the total live births of 1,321 people.

1. Timeliness of SHK specimen collection

The results showed that the age of the infant when the specimen was taken for the period of January-March 2024 fluctuated. The most ideal blood specimen according to the Minister of Health Regulation No. 78 of 2014 is when the baby is 48-72 hours old, and it can still be tolerated if taken between the ages of 24-48 hours. The complete data is categorized into Punctual, Too Early and Too Late, without taking into account the baby's special conditions such as prematurity, low birth weight, in the NICU *(Neonatal Intensive Care Unit)* care period, and others. Based on Table 1, it is known that, in January there were 484 (47.21%) specimens taken when the baby was > 1 day old to 3 days old (On time), in February 298 (34.33%), in March 436 (45%) of a number of babies who were SHK every month. The category of Too early (24-hour <) in January, February, and March was 221 (21.56%), 373 (42.97%), and 198 (20.43%) respectively. Late sampling of SHK in January was 320 (31.21%), February 197 (22.7%), and March 335 (34.57%).

Table 1
Timeliness of SHK Specimen Collection

Moon	N	On time n (%)	Too early n (%)	Late n (%)
January	1025	484 (47,21%)	221 (21,56%)	320 (31,21%)
February	868	298 (34,33%)	373 (42,97%)	197 (22,7%)
March	969	436 (45%)	198 (20,43%)	335 (34,57%)

Note:
- Punctuality: if the age at the time the specimen was taken > 1 day and up to 3 days of age
- Too early: if the age at the time the specimen was taken < 1 day
- Late: if the age at the time the specimen was taken ≥ 4 days

2. Timeliness of delivery of SHK specimens

The results of the study showed that all health facilities sent specimens to the Sampang Regency Health Office and received at the Laboratory of Dr. Soetomo Hospital Surabaya most of them on time (age at the time the specimen was sent ≤ 10 days) in January 838 (82%), February 703 (81%), March 882 (91%). For specimens received at the Laboratory of Dr. Soetomo Hospital Surabaya > 10 days in January as many as 187 (18%), February 165 (19%), March 87 (9%). The most ideal specimen delivery according to the Minister of Health Regulation No.78 of 2014 is no more than 7 days from the time the specimen is taken and the delivery journey time is not more than 3 days. Table 2 presents complete data categorized as on-time and late regardless of the length of the delivery journey. Based on information from health workers implementing the program, it is known that specimens are sent by 1-day express delivery service.

Table 2
Timeliness of delivery of SHK specimens

Moon	N	On time n (%)	Late n (%)
January	1025	838 (82%)	187 (18%)
February	868	703 (81%)	165 (19%)
March	969	882 (91%)	87 (9%)

Note:
- On time: if age at the time of specimen delivery ≤ 10 days
- Late: if the age at the time the specimen is shipped > 10 days

3. Unreadable SHK paper *(Reject)*

The results of the study showed that as many as 168 (16%) SHK specimens were unreadable*/rejected* at the Dr. Soetomo Laboratory in Surabaya in January. The number of *rejection cases* increased in February by 154 (18%), and in March by 190 (20%) cases of the total specimens examined each month. The results of the examination with the conclusion that the specimen was illegible were received by the Sampang Regency Health Office and distributed to all related health facilities.

Table 3
Unreadable SHK paper/*Reject*

Moon	N	Unreadable n (%)	Unread/*reject* n (%)
January	1025	857 (84%)	168 (16%)
February	868	714 (82%)	154 (18%)
March	969	776 (80%)	193 (20%)

Discussion

The results of the research on the implementation of SHK in January – March 2024 regarding the timeliness of specimen collection, data were obtained in January there were 484 (47.21%) specimens taken when the baby was > 1 to 3 days old (on time), specimen collection at the age of <24 hours (too early) as many as 221 (21.56%) while 320 (31.21%) were late. The timely collection of SHK specimens in February was 298 (34.33%), 373 (42.97%) too early, and 197 (22.7%) late. Meanwhile, in March, 436 (45%) specimens were taken on time, 98 (20.43%) too early, and 335 (34.57%) late. The most ideal blood specimen is when the baby is 48 to 72 hours old.

Therefore, it is necessary to collaborate with pediatricians (Sp.A), obstetricians and gynecologists/obgyns (Sp.OG), general practitioners, nurses and midwives who assist in childbirth to take blood specimens of newborn babies on the third day. This means that the mother can be discharged after 48 hours postpartum (coordination with the delivery assistant is required). However, in certain circumstances, blood collection can still be tolerated between 24–48 hours. It is recommended that blood is not taken in the first 24 hours after birth because at that time TSH levels are still high, so it will give a number of high/false positive results *(false positive)* (Mukhlisatunnafsi, 2024).

If the baby has been discharged before 24 hours, then the specimen needs to be taken at the next neonatal visit through a home visit or the patient is asked to come to a health facility (Permenkes, 2014). The large number *of reject* values in the samples sent by health facilities is not only because there are only two health workers from each health facility who have been trained in 2023 by the Sampang Regency Health Office, but also because of the lack of information about the correct procedures regarding when the best time to take specimens, how to fill BMHP, blood specimen collection techniques and other things to support this SHK process. Until December 2023, the filter paper that has been examined by the dr. Soetomo from Sampang Regency as many as 4,343 and there are 647 (14.89%) SHK that are not read/*rejected*, this number increased in January-March 2024 as many as 515 (18%) rejected cases from 2,862 SHK specimens sent to the dr. Soetomo Laboratory. This shows that the quality of SHK results is still low.

A good quality sample of dry blood is required to ensure the results are trustworthy. However, when SHK was re-launched by the Indonesia government, the obstacle was the lack of retraining for all health workers, including midwives and nurses (Dumilah, Yulifah, Mansur, Suprapti, & Darwanty, 2023)

Blood Collection Methods and Places

The blood collection technique used is through the baby's heel *(heel prick*). This technique is the most highly recommended and most widely practiced method worldwide. The blood that comes out is dripped on special filter paper until the paper circle is full of blood, then after drying it is sent to the SHK laboratory, It should be carefully considered, the specimen collection from the baby's heel must be carried out in accordance with the procedure for taking dried blood drop specimens. Healthcare workers who can draw blood: trained doctors, midwives and nurses who provide services to newborns as well as health analysts (Goto et al., 2020).

The procedure for taking a blood specimen goes through the following stages:

1. Wash your hands with soap with clean running water and wear gloves
2. Warm the tip of the heel with a warmer or you can rub it with your hands (the skin will be red to indicate that the blood has flowed and is ready to be pierced using a lancet)
3. For smoother blood flow, position the legs lower than the baby's head
4. To make the baby calmer, specimen collection is done while breastfeeding the mother or with the baby's skin attachment to the mother's *skin (skin to skin contact)*
5. Determine the location of the puncture, namely the lateral part of the left or right heel according to the red area, (figure 1)
6. Clean the area to be punctured with a 70% alcohol cotton antiseptic, let it dry
7. Heel prick with disposable sterile lancets with a depth of 2 mm. Use a lancet with a *blade tip (blade tip lancet)* (picture 2)
8. After the heel is pierced, wipe the first drop of blood with sterile gauze (picture 3)

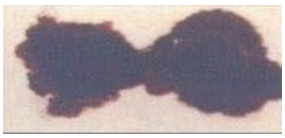
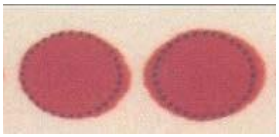
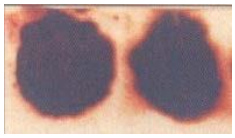
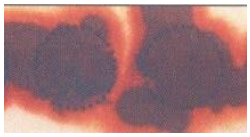
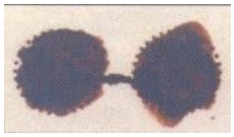
9. Then do a gentle massage so that a large enough drop of blood is formed. Avoid squeezing movements because it will result in hemolysis or blood mixed with tissue fluid. (picture 4)
10. Drip blood into the centre of the filter paper circle until the circle is fully filled and translucent on both sides, at least one full circle of the filter paper blood specimen is required.
11. After the filter paper circle is fully filled, press the puncture mark with sterile gauze/cotton swab while lifting the baby's heel until it is above the baby's head.

Figure 1 Figure 2 Figure 3 Figure 4

Errors in Specimen Collection

Table 4

Examples of bad specimens

Bad specimens:	Possible causes:
	▪ **Less blood drops** ▪ Dripping blood with a capillary pipette ▪ Hand contact paper, gloves, *lotion*
	▪ **Damaged filter paper,** dripping blood with a capillary pipette
	▪ **Sending specimens before drying**
	▪ **Dripping too much blood** ▪ Dripping blood on both sides of the paper circle
	▪ **Milking blood from the puncture site** ▪ Contamination ▪ Exposure to heat
	▪ Undried alcohol ▪ **contamination with alcohol and *Lotion*** ▪ Milking blood ▪ Poor drying
	▪ **Multiple drops of blood** ▪ Dripping blood on both sides of the paper circle

Conclusion

Congenital hypothyroidism (HK) is one of the causes of mental retardation in children that can be prevented if it is known and treated early. Congenital hypothyroidism (SHK) screening is very necessary to detect HK disease early because clinical symptoms have not yet appeared in newborns.

The timeliness of SHK specimen collection at the age of <24 hours (Too Early) was still quite high in the first quarter, the highest in February at 373 (42.97%). SHK sampling taken ≥ 4 days (Late) was the highest in March 335 (34.57%). The highest specimen delivery timeliness was in March 882 (91%), the highest specimen delivery delay was in January187 (18%). The most unreadable/uncheckable SHK paper *(Reject)* was in March 193 (20%).

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