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ACCURACY OF TIMING IN TSH SAMPLE COLLECTION FOR CONGENITAL HYPOTHYROIDISM SCREENING AT PRIMA MEDIKA GENERAL HOSPITAL DENPASAR

KETEPATAN WAKTU PENGAMBILAN SAMPEL TSH PADA SKRINING HIPOTIROID KONGENITAL DI RSU PRIMA MEDIKA DENPASAR

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Abstract

Congenital hypothyroidism (CH) is an endocrine disorder that can cause developmental delays if not detected and treated early. Congenital Hypothyroidism Screening (CHS) aims to detect abnormal levels of Thyroid Stimulating Hormone (TSH) in newborns before clinical symptoms appear. The timing of blood sample collection is a critical factor because TSH levels physiologically surge within the first 24 hours of life. This study aims to determine the accuracy of TSH sampling time in CH screening at Prima Medika General Hospital, Denpasar. A descriptive analytical method was used with a total sampling technique involving 105 neonates who underwent CHS from October to December 2024. Secondary data were obtained from laboratory request forms and the Laboratory Information System (LIS). Results showed that 92.4% of samples were collected on the second day of life, which aligns with the ideal window of 48–72 hours, and only 1.9% of neonates had elevated TSH levels. The study concludes that most sample collections met the recommended timing, contributing to valid results and effective CHS implementation. Timely sampling plays a vital role in early CH detection and reflects the overall quality of neonatal laboratory services.

Keywords: Neonates, Screening, Thyroid Stimulating Hormone

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Abstrak

Hipotiroid kongenital (HK) merupakan gangguan endokrin bawaan yang dapat menyebabkan keterlambatan tumbuh kembang bila tidak terdeteksi dan diobati sejak dini. Skrining Hipotiroid Kongenital (SHK) bertujuan untuk mendeteksi kadar *Thyroid Stimulating Hormone* (TSH) abnormal pada bayi baru lahir sebelum gejala klinis muncul. Waktu pengambilan sampel menjadi faktor krusial karena kadar TSH secara fisiologis meningkat dalam 24 jam pertama kehidupan. Penelitian ini bertujuan untuk mengetahui ketepatan waktu pengambilan sampel TSH pada skrining hipotiroid kongenital di RSU Prima Medika Denpasar. Penelitian ini menggunakan metode deskriptif analitik dengan teknik total sampling terhadap 105 neonatus yang menjalani SHK pada Oktober–Desember 2024. Data sekunder diperoleh dari formulir permintaan laboratorium dan sistem informasi laboratorium (LIS). Hasil menunjukkan bahwa 92,4% sampel diambil pada hari ke-2 sesuai waktu ideal (48–72 jam), dan hanya 1,9% neonatus memiliki kadar TSH tinggi. Simpulan penelitian ini menunjukkan bahwa sebagian besar pengambilan sampel telah sesuai standar waktu ideal, yang berkontribusi terhadap validitas hasil dan efektivitas program SHK. Ketepatan waktu pengambilan spesimen berperan penting dalam deteksi dini HK dan kualitas pelayanan laboratorium neonatal.

Kata Kunci: Neonatus, Skrining, Thyroid Stimulating Hormone

1. INTRODUCTION

The neonatal period is a critical phase in an infant's life, marked by rapid physiological and metabolic development. One of the conditions that must be detected early during this period is Congenital Hypothyroidism (CH), characterized by insufficient production of thyroid hormones, which are essential for regulating metabolism, brain development, and central nervous system maturation. Globally, CH affects approximately 1 in every 2,000–4,000 live births (Cherella & Wassner, 2017). In Indonesia, the national prevalence remains undocumented due to limited implementation of universal newborn screening programs across healthcare facilities (W. Setyaningsih & Wulandari, 2022).

Newborn Screening for Congenital Hypothyroidism (NSCH) aims to identify infants with abnormal thyroid hormone levels as early as possible, ideally before the appearance of clinical signs that are often irreversible. The screening is performed by measuring Thyroid Stimulating Hormone (TSH) levels from capillary blood obtained via heel prick between 48–72 hours after birth (Ministry of Health RI, 2014). This time frame is crucial, as a physiological surge in TSH occurs within the first 24 hours of life, potentially leading to false-positive results. Therefore, sampling prior to this recommended window may result in misdiagnosis (Decroli & Kam, 2017).

The implementation of NSCH is recognized as one of the most cost-effective preventive health interventions, significantly reducing the incidence of mental retardation and developmental disorders that are otherwise irreversible. Without prompt diagnosis and appropriate treatment, infants with CH are at risk of permanent impairments such as delayed speech, significantly reduced IQ (below 70), and severe motor coordination deficits (Muharis & Triani, 2024). These outcomes carry long-term consequences for the child's quality of life, as well as substantial psychosocial and economic burdens for families. From a policy standpoint, the Indonesian government has mandated NSCH through Ministerial Regulation

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No. 78 of 2014 (Ministry of Health RI, 2014). Nevertheless, implementation at the ground level continues to face challenges, including delays in sample collection, limited parental awareness, and shortages of trained personnel and logistical support within health facilities (Dumilah et al., 2023).

Data from the Pediatric Endocrinology Coordination Unit at several major hospitals in Indonesia indicate that more than 70% of CH cases are diagnosed late—often after the child is older than one year (Nugraha & Pradiptha, 2023). In contrast, a study by Martini et al. (2022) emphasized that early diagnosis and initiation of thyroid hormone therapy within the first month of life can prevent nearly all forms of developmental delay associated with CH. Although RSU Prima Medika Denpasar has implemented NSCH since 2022 and refers samples to the reference laboratory at RSUP Prof. Dr. I G.N.G. Ngoerah, there is a lack of evaluative data to assess whether the timing of sample collection aligns with established standards. Inappropriate timing of TSH specimen collection may result in delayed diagnosis, invalid test outcomes, and missed opportunities for optimal therapeutic intervention (Majid et al., 2020). Previous studies from various regions underscore the crucial role of pre-analytical phase optimization in ensuring the success of NSCH programs (Khairunnisa et al., 2022). The pre-analytical phase includes educating healthcare personnel on the ideal window for sample collection, managing collection and transportation timelines, and ensuring the availability of necessary logistics such as blood sampling tools, filter paper, and transport systems to referral laboratories. Without robust pre-analytical procedures, laboratory test quality may deteriorate, leading to diagnostic delays and loss of early treatment opportunities (Lima-Oliveira et al., 2017).

Research by Darmawan et al. (2024) identified that most delays in NSCH execution were due to sampling outside the optimal 48–72 hour window. They also reported disparities in procedural understanding among healthcare facilities, particularly in resource-limited areas lacking equitable training. Similar findings were reported by Hiola et al. (2022) at RSU Prof. Dr. H. Aloe Saboe, Gorontalo, where deviations from the recommended sampling time were primarily attributed to insufficient dissemination of standard operating procedures (SOPs) to nurses and midwives, as well as dependence on physician rounds. Furthermore, Sonia et al. (2025) in their study at Puskesmas Bengkuang highlighted logistical challenges, such as delays in transporting samples to the referral laboratory, resulting in invalid results due to specimens exceeding the recommended storage duration.

Therefore, timeliness is a key indicator of neonatal laboratory service quality and the overall effectiveness of the NSCH program. Accurate timing during the pre-analytical phase not only ensures the validity of TSH measurements but also directly impacts the success of early detection and the prevention of irreversible developmental impairments caused by congenital hypothyroidism (Anggraini et al., 2017). Based on this background, this study aims to evaluate the timeliness of TSH sample collection in the context of newborn screening for congenital hypothyroidism at RSU Prima Medika Denpasar. The findings are expected to contribute scientific evidence for improving the screening system, supporting national health policies, and reducing long-term morbidity due to delayed CH diagnosis.

2. RESEARCH METHOD

This study is a descriptive-analytic observational study conducted at the Clinical Pathology Laboratory of RSU Prima Medika Denpasar, Bali. Data collection was carried out from January to

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March 2025, using secondary data from newborn screening for congenital hypothyroidism (NSCH) conducted between October and December 2024. The study population consisted of all neonates who underwent Thyroid Stimulating Hormone (TSH) testing at RSU Prima Medika during the specified period. A total sampling technique was employed, yielding a sample size of 105 neonates. Data were obtained from laboratory request forms and the Laboratory Information System (LIS), including information on the time of specimen collection, the neonate's age at the time of sampling, and the TSH test results. Blood samples were collected by the researcher using the heel prick method, and capillary blood was applied onto filter paper (dried blood spot/DBS), air-dried, and sent to the reference laboratory at RSUP Prof. Dr. I G.N.G. Ngoerah for further analysis. Data were analyzed descriptively using univariate statistical methods to present the frequency distribution of sample collection age and TSH concentration levels. This study received ethical approval from the Ethics Committee of STIKES Wira Medika Bali, with approval number: 424.E1.STIKESWIKA/EC/III/2025.

3. RESULTS AND DISCUSSION

In this study, the characteristics of the research subjects based on sex and neonatal age are presented in the following tables:

Table 1. Characteristics of Neonates by Sex

No	Sex	Number of Neonates	Percentage
1	Male	50	47.6 %
2	Female	55	52.4 %
	Total	105	100%

Table 2. Characteristics of Neonates by Age at Sampling

No	Age (days)	Number of Neonates	Percentage
1	1 Day	4	3.8 %
2	2 Day	97	92.4 %
3	3 Day	4	3.8 %
	Total	105	100%

Based on Tables 1 and 2, the distribution of neonates by sex was relatively balanced, with 50 males (47.6%) and 55 females (52.4%). The majority of TSH sample collections were performed on day 2 of life (97 neonates or 92.4%), while only 4 neonates each (3.8%) were sampled on day 1 and day 3, respectively. This age distribution reflects compliance with the recommended timeframe for neonatal TSH screening, namely between 48 to 72 hours after birth, which is considered optimal for minimizing false positives due to the physiological TSH surge during the first 24 hours of life.

Table 3. TSH Screening Results of Neonates

No	TSH Result	Number of Neonates	Percentage

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1	High	2	1.9 %
2	Normal	103	98.1 %
	Total	105	100%

Among the 105 neonates screened for congenital hypothyroidism (CH) at RSU Prima Medika Denpasar, only 2 neonates (1.9%) showed elevated TSH levels, while 103 neonates (98.1%) had TSH values within normal limits. This indicates a low prevalence of potential congenital hypothyroidism in this population. These results are consistent with estimates from the Indonesian Ministry of Health (2014), which reports an incidence of CH between 1 in 3,000 to 1 in 4,000 live births.

Discussion

Physiologically, elevated neonatal TSH levels may serve as an early marker of thyroid dysfunction (Setyaningsih et al., 2023), underscoring the importance of conducting newborn screening within the ideal timeframe of 48–72 hours post-delivery. The findings in this study support the hypothesis that timeliness in the pre-analytical phase plays a crucial role in ensuring the validity of TSH measurements, particularly in neonates. Timely specimen collection is not merely a procedural formality but reflects the overall quality of laboratory services and the effectiveness of the NSCH program. In neonatal laboratory practice, timing encompasses several critical steps—sample collection, drying, storage, and transport—all of which impact the stability and integrity of dried blood spot (DBS) specimens used for TSH analysis. National guidelines, as stipulated in Minister of Health Regulation No. 78 of 2014, emphasize that blood collection for NSCH should occur between 48 to 72 hours postnatal to reduce the risk of false positives or inaccurate diagnoses caused by physiological TSH elevation in the first 24 hours of life.

Sampling performed too early may result in elevated TSH levels that do not reflect actual thyroid dysfunction. Conversely, delayed sampling increases the risk of TSH degradation due to improper storage conditions, which may cause missed diagnoses. Anggraini et al. (2017) highlight that delays in sample collection or transport can compromise test validity and lead to delayed initiation of therapy. As such, sample collection timing is an indirect yet critical indicator of quality and logistical efficiency within the NSCH system. In this study, the fact that most specimens were collected on the second day of life suggests that the hospital adhered to recommended screening protocols, likely contributing to the high percentage of normal TSH findings. This aligns with evidence that appropriate timing in specimen collection enhances the reliability of screening outcomes and facilitates early medical intervention where necessary (Dumilah et al., 2023).

This observation is further supported by Sonia et al. (2025), whose study in Kalimantan reported a similarly low proportion of neonates with elevated TSH levels, indicating effective screening implementation. Likewise, Pulungan et al. (2024) found low TSH elevation prevalence in government hospitals, although they noted delayed diagnoses were still common due to limited screening coverage and delayed confirmatory testing. However, not all studies align with these findings. Research by Anggraini et al. (2017) in Yogyakarta revealed a higher proportion of elevated TSH results, many of which were attributed to delayed sample delivery to reference laboratories, leading to sample degradation. Martini et al. (2022) also reported

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cases where neonates exhibited signs of hypothyroidism but were missed during initial screening, highlighting existing gaps in the early detection and timeliness of NSCH programs. These disparities may stem from contextual factors, such as logistics management, healthcare provider readiness, parental education, and adherence to the recommended sampling window. In this context, RSU Prima Medika Denpasar appears to have successfully implemented timely TSH sample collection protocols, as evidenced by the large proportion of samples obtained within the ideal timeframe. Consequently, timeliness in sample collection is considered a key component of successful CH screening and a quality indicator for neonatal laboratory services. Nonetheless, this study has several limitations. First, it was conducted at a single private hospital over a limited time frame, which may not fully represent the broader implementation of NSCH in Bali or Indonesia. Second, due to the use of secondary data, the researchers had no access to follow-up results (e.g., serum TSH and FT4) for the two neonates with elevated TSH, making it impossible to determine whether the cases were permanent or transient CH. Third, the study did not examine maternal risk factors, such as nutritional status, thyroid disease history, or environmental exposures, which could influence neonatal TSH levels.

4. CONCLUSION

The study concluded that the majority of neonates screened for congenital hypothyroidism at RSU Prima Medika Denpasar between October and December 2024 had TSH levels within the normal range, with only a small fraction showing elevated results. This finding suggests that the screening process—particularly regarding the timeliness of sample collection—was conducted effectively. However, to improve diagnostic accuracy and the overall effectiveness of the NSCH program, broader research coverage, follow-up on abnormal cases, and integration of clinical and maternal risk data are necessary components of a comprehensive evaluation of neonatal screening success.

5. REFERENCES

Anggraini, R., Patria, S. Y., & Julia, M. (2017). Ketepatan Waktu Pelayanan Skrining Hipotiroidism Kongenital di Yogyakarta. *Sari Pediatri*, *18*(6), 436. https://doi.org/10.14238/sp18.6.2017.436-42

Cherella, C. E., & Wassner, A. J. (2017). Congenital hypothyroidism: insights into pathogenesis and treatment. *International Journal of Pediatric Endocrinology*, *2017*(1), 11. https://doi.org/10.1186/s13633-017-0051-0

Darmawan, S. F., Hartati, D., Sulistyorini, C., & Risnawati, R. (2024). The Influence of Health Education on the Interest of TM III Pregnant Women in Screening for Congenital Hypothyroidism in Newborn Babies. *Journal of Midwifery and Nursing*, *6*(2), 464–469. https://doi.org/10.35335/jmn.v6i2.5069

Decroli, E., & Kam, A. (2017). Dampak Klinis Thyroid-Stimulating Hormone. *Jurnal Kesehatan Andalas*, *6*(1), 222. https://doi.org/10.25077/jka.v6i1.674

Dumilah, R., Yulifah, R., Mansur, H., Suprapti, S., & Darwanty, J. (2023). Implementasi Pelaksanaan Program Skrining Hipotiroid Kongenital (Shk): Literature Review. *Media Penelitian Dan Pengembangan Kesehatan*, *33*(4), 168–178. https://doi.org/10.34011/jmp2k.v33i4.1810

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Hiola, F. A. A., Hilamuhu, F., & Katili, D. N. O. (2022). Faktor-Faktor yang Mempengaruhi Cakupan Pelaksanaan Skrining Hipotiroid Kongenital di Rsu Prof. Dr. H. Aloe Saboe Kota Gorontalo. *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*, *5*(4), 435–440. https://doi.org/10.56338/mppki.v5i4.2218

Kemenkes RI. (2014). Peraturan Menteri Kesehatan RI Nomor 78 Tentang Hipotiroid Kongenital. In *Lampiran Peraturan Menteri Kesehatan RI Nomor 78 Tentang Hipotiroid Kongenital Pedoman Hipotiroid Kongenital* (Issue 1751).

Khairunnisa, M., Purwoko, S., Latifah, L., & Yunitawati, D. (2022). Evaluasi Pelaksanaan Program Stimulasi, Deteksi, dan Intervensi Dini Tumbuh Kembang di Magelang. *Jurnal Obsesi : Jurnal Pendidikan Anak Usia Dini*, *6*(5), 5052–5065. https://doi.org/10.31004/obsesi.v6i5.1885

Lima-Oliveira, G., Volanski, W., Lippi, G., Picheth, G., & Guidi, G. C. (2017). Pre-analytical phase management: a review of the procedures from patient preparation to laboratory analysis. *Scandinavian Journal of Clinical and Laboratory Investigation*, *77*(3), 153–163. https://doi.org/10.1080/00365513.2017.1295317

Majid, H., Ahmed, S., Siddiqui, I., Humayun, K., Karimi, H., & Khan, A. H. (2020). Newborn screening for congenital hypothyroidism: improvement in short-term follow-up by audit and monitoring. *BMC Research Notes*, *13*(1), 563. https://doi.org/10.1186/s13104-020-05400-y

Martini, N. W. D., Nyandra, M., & Kurniati, N. M. (2022). Studi Kasus Hipotiroid pada Anak di UPTD Puskesmas Kediri I Kabupaten Tabanan. *Jurnal Kesehatan, Sains, Dan Teknologi (Jakasakti)*, *1*(1). https://doi.org/10.36002/js.v1i1.1948

Muharis, I. A., & Triani, E. (2024). Literature Review: Skrining Dan Tatalaksana Hipotiroid Kongenital. *Jurnal Ilmu Kedokteran Dan Kesehatan*, *11*(1), 057–064. https://doi.org/10.33024/jikk.v11i1.13000

Nugraha, I. B. A., & Pradiptha, I. P. Y. (2023). Hipotiroid Kongenital Dan Gangguan Pendengaran. *Ganesha Medicine*, *3*(2), 77–83. https://doi.org/10.23887/gm.v3i2.66825

Pulungan, A. B., Puteri, H. A., Faizi, M., Hofman, P. L., Utari, A., & Chanoine, J.-P. (2024). Experiences and Challenges with Congenital Hypothyroidism Newborn Screening in Indonesia: A National Cross-Sectional Survey. *International Journal of Neonatal Screening*, *10*(1), 8. https://doi.org/10.3390/ijns10010008

Setyaningsih, E., Avisha, F., & Syahnidep, R. (2023). *Hipotiroid Kongenital*. Artikel Kesehatan Rumah Sakit Universitas Indonesia. https://rs.ui.ac.id/umum/berita-artikel/kelainan-penyakit/hipotiroid-kongenital?utm_source=chatgpt.com

Setyaningsih, W., & Wulandari, R. D. (2022). The Evaluation of Congenital Hypothyroidsm Screening Program in Indonesia: A Literature Review. *Jurnal Aisyah : Jurnal Ilmu Kesehatan*, *7*(2). https://doi.org/10.30604/jika.v7i2.1161

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Sonia, Zulliati, Redjeki, D. S. S., & Suhartati, S. (2025). Identifikasi Pelaksanaan Skrining Hipotiroid Kongenital di Wilayah Kerja UPT Puskesmas Bengkuang. *Health Research Journal of Indonesia*, *3*(3), 187–192. https://doi.org/10.63004/hrji.v3i3.633