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Diagnosis of Congenital Hypothyroidism by Analysis of Medical Records

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Abstract: Congenital hypothyroidism is one of the causes of mental retardation in children that can be prevented if recognized and treated early. Thyroid hormones play a role in the development of the central nervous system. It is known that 95% of CH do not show typical clinical signs and symptoms at birth and the duration of early intervention to prevent mental retardation is short. Therefore, most developed countries have conducted neonatal screening programs for early detection of CH. The purpose of this study was to determine the diagnosis and management of congenital hypoteroid based on medical record analysis. This research method is a cross-sectional descriptive study with a quantitative approach to patient medical records. Data were analyzed in accordance with the standard diagnosis and management of congenital hypoteroid issued by the Pediatric Association in 2017. The clinical practice guidelines explain that congenital hypothyroidism can be transient or permanent and is classified according to the location of the disorder: primary (in the thyroid gland) or secondary (in the pituitary and/or hypothalamus); severity of hypothyroidism: (serum TSH levels > 100 mIU/L are considered severe; and age of onset of hypothyroidism. The most common form is permanent primary CH (high serum TSH levels) due to thyroid dysgenesis. Permanent CH requires lifelong treatment while transient CH does not. The results of the study have met clinical guidelines, namely CH screening in newborns is positive if the TSH level is ≥ 20 mU/L. Infants with positive screening results must be confirmed by re-checking serum TSH and FT4. The diagnosis of CH is made when TSH levels are high and FT4 is low. In non-screened infants, the diagnosis is made through clinical symptoms and serum TSH and FT4 examination.

Keywords: Diagnosis; Congenital Hypothyroidism; Medical Records

Introduction

Document management using electronic based-computer systems in the health sector which is becoming a global trend is electronic medical records (EMR) (Ahmed et al., 2020; Pribadi et al., 2018). Electronic Medical Records is a system that stores patient information such as medical history, test results, and medications electronically (Hsieh et al., 2013). Electronic Medical Records can improve health care delivery by facilitating physician communication about medications, improving documentation, increasing efficiency, and encouraging information sharing and responsibility with patients (Shield et al., 2010). The assembling section monitors the quality of medical record files by conducting quantitative analysis to determine the completeness of a medical record file (Edi & Sugiarto, 2017; Widjaya & Siswati, 2019; Yunita, 2014).

From these files, cases related to CH can also be accessed. Congenital hypothyroidism results in delayed physical and mental growth and development of children. Intellectual disability caused by congenital hypothyroidism can be prevented if recognized and treated early. Hypothyroid symptoms are not easily recognized, so it is important for newborns to be screened for congenital hypothyroidism to avoid fatal consequences (Engelhardt et al., 2023). This guideline contains recommendations that can serve as a reference

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for pediatric colleagues in providing care to patients with congenital hypothyroidism.

Congenital hypothyroidism (CH) is one of the causes of mental retardation in children that can be prevented if recognized and treated early (Bin et al., 2023). Thyroid hormones play a role in the development of the central nervous system (including migration and myelination). It is known that 95% of CH do not show typical clinical signs and symptoms at birth and the duration of early intervention to prevent mental retardation is short. Therefore, most developed countries have conducted neonatal screening programs for early detection of CH.

The global incidence rate of CH based on neonatal screening results is 1:2000 to 1:3000, while in the pre-screening era the incidence rate was 1:6700 live births. The incidence rates in several Asia-Pacific countries that have conducted national screening for neonatal CH are as follows: Australia 1:2125, New Zealand, 1:960, China 1:2468, Thailand 1:1809, Philippines 1:2673, Singapore 1:3500, and Malaysia 1:3029. Neonatal CH screening in Indonesia has not been implemented nationally, only sporadically in some areas in certain hospitals.

The preliminary program of neonatal CH screening in 14 provinces in Indonesia gave a provisional incidence of 1:2513. Based on data from the CH registry of the Pediatric Endocrinology Work Coordination Unit of the Indonesian Pediatric Association (IDAI) sourced from several specific hospitals in Indonesia, most CH patients experience delays in diagnosis so that they experience impaired growth and motor development and intellectual impairment. The delay in the provision of initial therapy affected IQ, which was an average of 51 in cases that received initial therapy at the age of 1.5 years. This study also showed that normal FT4 levels maintained better intellectual development in the remaining time of brain development.

Congenital hypothyroidism can be transient or permanent and is classified according to the location of the disorder (Long et al., 2020): primary or secondary (in the pituitary and/or hypothalamus); severity of hypothyroidism: (serum TSH levels > 100 mU/L are considered severe; and age of onset of hypothyroidism (intrauterine is more severe) (Pediatrics et al., 2006). The most common form is permanent primary CH (high serum TSH levels) due to thyroid dysgenesis. Permanent CH requires lifelong treatment while transient CH does not.

Method

The type of research used in this study is descriptive research with a qualitative approach (Amroze et al., 2019; Arikunto, 2006; Sugiyono, 2017). The data taken, identified in the following order: data collection; data sorting; data analysis; conclusion making. As for data analysis, there is a predetermined sequence in accordance with the empirical steps taken, namely as follows: examination of data; suspected data findings; data confirmation; diagnosis; and action (Hidayat, 2011). In the diagram can be described as the flow of research as follows Figure 1.

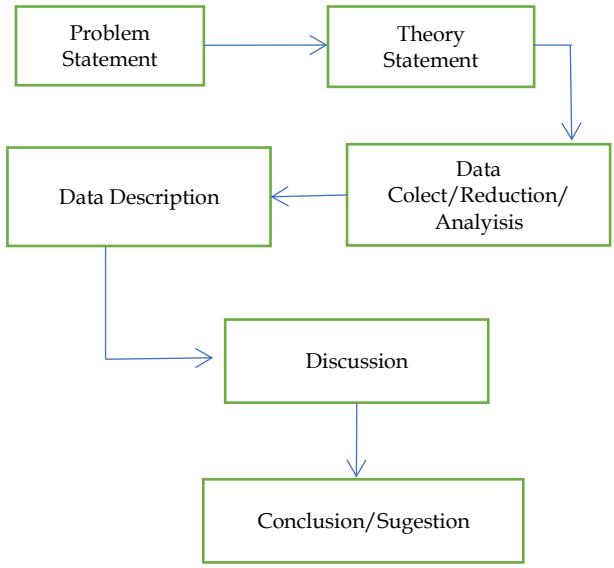

Figure 1. Flow of Research

The description of the data, presentation, analysis and findings that will be obtained from this study will be written in the paragraphs below, in the research discussion segment.

Result and Discussion

Screening and Interpretation

Early detection and treatment of CH through neonatal screening programs prevents disability due to neurodevelopmental disorders and optimizes development (Donaldson & Jones, 2013; Tangeraas et al., 2023). The goal of neonatal screening is to detect all mild, moderate and severe forms of primary CH. The strategy is by detecting severe CH as early as possible, Disability caused by Primary CH is largely due to patients not receiving therapy before the age of 3 months of age.

Screening using TSH examination is the most sensitive test for detecting primary CH (Rastogi & LaFranchi, 2010). Screening Primary CH is effective after 24 hours of age, although the best time for screening is 48 hours to 72 hours after birth (Tang et al., 2016). Screening performed before 48 hours of age increases the rate of due to the TSH surge in newborns (Fox et al., 2020).

The meaning of screening were : (1) Early detection of CH through newborn screening is the best strategy at present, (2) Congenital hypo thyroid screening in newborns is done by checking TSH, (3) TSH screening in at term infants is done at 2- 4 days of age or at the time of discharge from the hospital, (4) CH screening in newborns is positive if TSH level ≥ 20 mU/L. (5) Infants with a positive screening result should be confirmed by re-screening serum TSH and FT4 (6) The diagnosis of CH is made when TSH is high and FT4 is low.(7)In non-screened infants, the diagnosis is made through clinical symptoms and serum TSH and FT4 examination. Serum TSH and FT4 examination should always refer to the age-appropriate range of age-appropriate normal values, so that the normal values of neonates that are used to assess the results of CH screening in neonates.

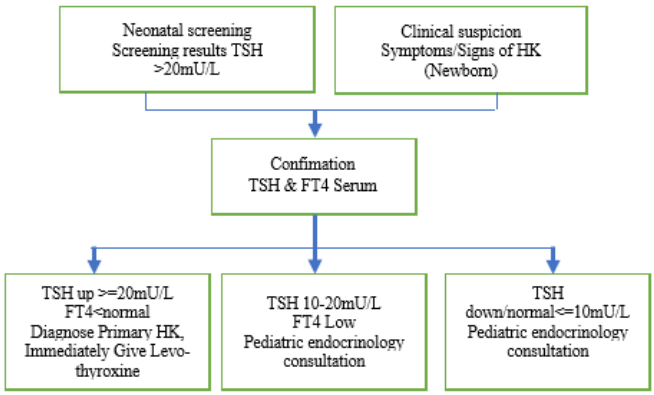

Figure 2. The algoritm of diagnostik

In aterm infants, normal TSH levels increase dramatically by 60-80 mU/L within 30 to 60 minutes after birth (TSH surge), then then rapidly decreases to a level of 20 mU/L on the first day of birth and then gradually decreases to 6-10 mU/L by 7 days of age.

The rapid increase in TSH levels at the beginning of birth will stimulate T4 secretion, with peak levels of 10-22 mcg/ dl (128.7 - 283.2 nmol/L) at 24-36 hours after birth. T3 levels also increase to 250 ng/dL (3.9 nmol/L) this is due to the increased conversion of T4 to T3 in peripheral tissues and thyroid gland secretion. T4, FT4, and T3 levels will gradually decrease by 4 weeks after birth, with total T4 levels of 7-16 mcg/dL (90.1- 205.9 nmol/L), fT4 0.8 - 2.0 ng/dL (10.3 - 25.7 pmol/L), and TSH levels of 0.9 to 7.7 mU/L, which are higher than those in people. these levels are higher than those in adults.

In preterm infants especially 24-27 weeks gestation the rise in TSH and FT4 levels is lower than that of a term infant, which can be attributed to the lower TSH and FT4 levels. This is due to the immature hypothalamic-pituitary-thyroid axis infants preterm infants normally have low umbilical T4 levels at at birth, and the rise in T4 is late. More than 95% of newborns with CH have no clinical symptoms at birth. Maternal T4 hormone can cross the placenta, so infants who cannot make thyroid hormone who are unable to make thyroid hormone will still have T4 levels levels at 25-50% of the average normal infant. Length and weight within normal limits, but large fontanel. At a later age there will be persistent open posterior fontanelle, lethargy, hypotonia, hoarse cry, constipation constipation, drinking problems, macroglossia, umbilical hernia, cutis marmorata, hypothermia, and prolonged neonatal jaundice.

Infants with TSH ≥ 20 mU/L and low FT4 are considered as Primary CH, the infant should be examined immediately and given levothyroxine. levels TSH ≥ 10 mU/L in infants ≥ 2 weeks of age is abnormal and should be treated with be treated. If not treated, TSH and FT4 tests should be repeated at 2 weeks and 4 weeks, and therapy should be given if levels of TSH and FT4 levels are abnormal. High screening TSH levels should be communicated to the pediatric endocrine team. Radiologic scintigraphy and thyroid ultrasonography to look for the presence or absence of a thyroid gland, the size of the size, or ectopic thyroid gland should be done at a hospital with available facilities for such examinations.

Treatment Measures

Early administration of levothyroxine therapy in the first 2 weeks of life showed very significant results in neurodevelopment and in achieving intellectual outcomes in children with CH.

The severity of CH is determined by T4 levels if T4 levels < 5 pmol/L = severe, 5-<10 pmol/L = moderate, and 10-15 pmol/L = mild) and with the severity of bone age is a predictive factor of nerve development. Absence of one or both epiphyses genu is known to be associated with T4 levels at diagnosis; and prognosis of IQ, making it a reliable index of intrauterine hypothyroidism.

The goal of CH management is to ensure optimal growth and development (neuro development) as optimally as possible to reach its genetic potential. To achieve this, it is necessary to consider factors that will affect the treatment outcome, namely drug adequacy, severity of CH, compliance, socioeconomics and comorbidities. Long term monitoring IDAI Endocrinology periodic monitoring of FT4 and TSH is essential, to ensure adequate thyroid levels. Developmental monitoring covers two areas; cognitive function including IQ deficits, behavior, memory and attention, and motor sensory including fine motor, and hearing loss. Attention to behavior should be started from the time of diagnosis until school age memory impairment can be corrected with specific training.

Repeated examinations of hearing tests not only at the time of infancy, but should also be done before school age and subsequently if necessary. Early therapy

with adequate doses of medication during childhood and adolescence can prevent growth retardation and maturation. adolescence can prevent growth retardation and bone maturity, without being affected by the severity of CH.

Hypothyroidism can also cause puberty and fertility disorders. Some patients show precocious puberty with macro-orchidism in boys and ovarian enlargement with multiple cysts in girls. All efforts to achieve optimal treatment outcomes are not successful without adherence to periodic evaluations. In this case, education at each visit greatly influence compliance.

Quantitative Analysis of Patient Identification Filling

Based on the results of the study, it is known that the highest percentage of completeness of filling in the patient identification component is found in the item full name and medical record number of 182 medical records 100% which are completely filled in. The lowest percentage was in the items of place, date of birth and gender of 181 medical records 99% which were completely filled in.

This is in line with the research of (Nisa et al., 2021) on "Quantitative Analysis of Outpatient Medical Record Documents at the Gondanglegi Health Center". Based on the results of this study, it was found that the completeness of filling in the identification review in medical record documents in the patient name section of 95 documents was completely filled in 100%. However, in the medical record number section as much as 1% is incomplete. This is because there are still several empty medical record number columns in the medical record document because the officer only writes the medical record number in the medical record document folder (Rudi, 2020). This happened because the officer forgot due to the rush due to the large number of patients and did not write the medical record number on the new document and the medical record number in the column in the document was not filled in because the folder already had the patient's medical record number.

This is also in line with Giyatno & Rizkika (2020) on "Quantitative Analysis of Completeness of Medical Record Documents for Inpatients with Femur Fracture Diagnoses at Dr. R.M. Djoelham Binjai Hospital". Based on the results of the study, it was found that the highest percentage of completeness of filling in the patient identification component in inpatients diagnosed with femur fracture was found in the patient's name item of 20 medical record documents 56%, medical record number of 20 medical record documents 56% which were completely filled in, and date of birth of 20 medical record documents 56% which were completely filled in. The lowest percentage was found in the gender item of 10 medical record documents 28% that were completely filled in.

According to Hatta (2013) medical record documents are said to be complete if all the data contained therein are filled in completely and correctly according to the provisions set in the hospital. Especially the completeness of identification which aims to ensure the owner of the medical record document. The contents of the identification review on each sheet of medical record documents including administrative data as demographic information must be filled in completely because if it is not filled in, it cannot inform the patient's identity as a statistical database, research and planning source for hospitals or health service organizations.

Quantitative Analysis on Completeness of Important Reports

Based on the results of the study, it is known that the highest percentage of completeness of filling in the completeness component of important reports / notes is found in the item of development notes of 176 medical records (97%) which are completely filled in. The lowest percentage was in the proof of treatment item of 148 medical records (81%) which were completely filled in.

This is in line with Dzulhanto (2018) research on "Completeness of Filling Hernia Disease Medical Record Documents with Quantitative Analysis Methods". Based on the results of the study, it was found that the highest percentage of completeness of important reporting forms was in the admission and discharge summary form, discharge patient resume, vital sign chart, integrated patient progress notes, nursing care summary, laboratory results, medical action approval letter, hospitalization statement letter as many as 43 medical record documents (100%).

This is also in line with Eriko & Widjaja (2017) on "Review of Quantitative Completeness of Medical Records at the Inpatient Unit of the Muhammadiyah Taman Puring Hospital". Based on the results of the study, it was found that the largest percentage of completeness was found in 3 items, namely integrated development notes, evidence of treatment and care, and notes on resume of 100%.

According to Permenkes 129 of 2008 concerning Minimum Hospital Service Standards states that the completeness of filling out medical records 24 hours after completion of services has a standard of 100%. According to Budi (2011), the deadline for completing the contents of medical records is no later than 2 x 24 hours from the time the medical record document is submitted to the data entry unit by the assembling officer. If the time limit is exceeded, the medical record document will be submitted to the filing department to be stored separately. The filling department will repeat the procedure again with a time limit of 14 x 24 hours after the time of submission of incomplete medical record documents.

Conclusion

CH is one of the causes of mental retardation that can be prevented with early therapy. Newborn screening is the best diagnostic strategy for early detection of CH. Early therapy with adequate levothyroxine will give optimal results. Questionable laboratory results should be referred to a pediatric endocrinologist. Clinical and laboratory monitoring is done at regular intervals. Family education is very important in optimizing treatment. Patient identification obtained an average completeness percentage of 99.5%. The highest percentage of completeness was in the items of full name and medical record number by 100%, while the lowest percentage of completeness was found in the items of place, date of birth and gender by 99%. Completeness of important reports obtained an average completeness percentage of 89%. The highest percentage of completeness was in the item of progress notes at 97%, while the lowest percentage of completeness was found in the item of proof of treatment at 81%. Authentication of the author obtained an average completeness percentage of 93%. The highest percentage of completeness was in the item of doctor's signature and nurse's signature at 97%, while the lowest percentage of completeness was found in the item of doctor's name at 88%. Good records obtained an average completeness percentage of 96%. The highest percentage of completeness is in the item no type-ex and empty parts by 100%, while the lowest percentage of completeness is found in the item no scribbles by 87%. The recapitulation of quantitative analysis among the four components obtained an average percentage of completeness of 95%, the highest completeness was found in the patient identification component of 99.5%, while the lowest percentage of completeness was found in the component of completeness of important reports / notes of 89%.

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Author Contributions
In this short study, researchers state that all contributors play an active role in the portion of cooperation that has been agreed together, so that the contribution is very valuable and provides an extraordinary completeness of the study. In the future, we will continue to prioritize fair and collaborative cooperation for the purpose of developing the knowledge we need.

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Conflicts of Interest
This research is aimed to developing science, so it can be declared free from any interest other than the development of science, especially the field of medicine, more specifically regarding artificial pregnancy services at RSIA Mutiara Bunda Padang. The funder did not interfere in the idea, proposal, implementation of research until the publication of the results of this study. Likewise, Mutiara Bunda Hospital was also not involved and intervened in the policy of this research. The hospital is only a research location and obtains data according to the research topic only. RSIA Mutiara Bunda was chosen only because it was the first hospital in the city of Padang to have a pregnancy program facility using the artificial insemination method.

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