

Research Article

Assessment Serum Bilirubin Levels and Pulse Oximetry Oxygen Saturation in Jaundiced Neonates: A Hospital-Based Study in Najaf, Iraq

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Abstract

Background: To ascertain if a newborn's oxygen saturation and serum bilirubin levels at the Al-Zahra Teaching Hospital in Najaf State are correlated. **Methodology:** A specific questionnaire was used to interview the sixty babies who made up the sample for this investigation. The present study seeks to achieve the aforementioned objectives during the April–May 2025 period. **Results:** found that, at $P > 0.05$, the differences were not significant. **Conclusion:** The study's primary serum bilirubin level decreased overall. Serum bilirubin and oxygen saturation SO_2 are not significantly correlated, and the total oxygen saturation measurement is little impacted. The overall evaluation is impacted by the demographic features.



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1. Introduction

Bilirubin is the major by-product of the breakdown of hemoglobin that is eliminated by old red blood cells. It is first linked with albumin, then moved to the liver, sent out into the bile, and turned into urobilinogen in the bowel - this is later changed into a watery form (glucuronic acid) by an enzyme called glucuronyltransferase [1]. While most of the urobilinogen produced is excreted in the stools, a minor amount is in fact swallowed and sent out by the kidneys. Because kidneys can only process conjugated bilirubin (which is known as the direct portion), high levels of direct bilirubin in the blood are associated with bilirubinemia [2]. It is neonatal jaundice, an established state that calls for treatment [3]. The adverse effects occur in 70 to 80% of newborn infants, with the preterm infant being the one most frequently affected [4]. Even though pathological hyperbilirubinemia affects only 5-10% of infants, the risk of brain damage (bilirubin encephalopathy) is ever present and increases with higher levels of bilirubin [5]. This fact implies that an understanding of the etiology of hyperbilirubinemia would go a long way in promoting subsequent pregnancies and means everything to the patient as far as the treatment process is concerned. Yet, in about 50% of neonatal hyperbilirubinemia cases, the underlying cause remains undiagnosed [6].

1.1. Lung Function

Chronic respiratory disorders are widely diagnosed illnesses that cause mortality [7]. Lung dysfunction in humans of all ages may arise from both short and extended exposure to high levels of air pollution [8]. Air pollution-induced lung stress in adults has been proven to have harmful effects on the lungs [7]. According to the SAPALDIA study, fluctuations in the parameters of FEV1, FVC, and FEV1/FVC ratio were adversely connected with an increase in bilirubin levels in the blood samples that were obtained. The amount of tobacco they had inhaled was also taken into consideration when sex, age, education, body size, and weight as indicated by the flow rate at 25-75% of FVC (FEF25-75%) were taken into account [9]. According to a longitudinal study by Sunghwan S. and Young RC. [10], the incidence of coronary artery disease (CAD) and the mortality rate from cardiovascular disease (CVD) were strongly negatively linked with the baseline level of bilirubin. Kunutsor SK et al. [11] demonstrated an independent connection between total bilirubin levels and the risk of CVD. Total bilirubin, however, was not considerably added to the list of recognised parameters that impact the capacity to anticipate cardiovascular risk. Higher bilirubin levels were connected with a lower risk of lung cancer, according to a thorough investigation done in South Korea that searched for a connection between the disease and bilirubin levels within the normal range. Lower bilirubin levels and cigarette smoking were connected to an increased risk of lung cancer. However, the probability of having lung cancer grows overall. JE Lim et al. [12]. Bilirubin levels were inversely linked with smoking intensity, duration, and behaviour. According to Kimm H et al. [13], smoking tobacco may contribute to the pathophysiology of oxidative stress-related lung function reduction. The association between air pollution and the findings of lung function tests is not extensively established. In this study, a large cohort of ostensibly healthy Israelis who participated in an annual health survey were requested to analyse this connection in terms of interactions between air pollution, bilirubin levels, and functional indicators [9].

1.2. Oxygen saturation (SO₂)

Blood oxygen content: It's constantly monitored using a noninvasive pulse oximeter [14]. Pulse oximetry is based on the absorption of light by the capillary bed that oscillates, this is typically located in the fingers or toes. The probe employs light sources that are invisible to the human eye, these are red and infrared light sources. Some of the light is absorbed by the skin and other tissue, but the only cause of the difference in absorption is the arterial pulsation. The SO₂ value for hemoglobin is derived from the difference in absorption spectrum at different wavelengths. Because pulse oximetry is unable to accurately determine the oxygen content of other hemoglobins, including Met-Hb or CO-Hb, it will not be able to recognize CO poisoning. For instance, even though the SO₂ value associated with a pulse oximeter is generally considered to be normal, a patient with elevated CO-Hb will have a decreased percentage of O₂-Hb. Schindler et al. [15] recommend that a co-oximeter that is designed to measure blood is necessary. The percentage of Met-Hb and the percentage of CO-Hb, as well as the percentage of O₂-Hb (and SO₂, if necessary).

1.3. ABO Incompatibility

Babies born to mothers with blood type O should be checked for jaundice on a regular basis and discharged after 72 hours. For newborns born to O group mothers, routine cord blood screening is recommended. During the first 24 hours, jaundice caused by ABO incompatibility often appears. If there is significant jaundice or if it appears within 24 hours, it should be done. At SB 12–17 mg/dl, intense phototherapy is advised, depending on the postnatal age of the infant (9). When TSB is more than 20 mg/dl, exchange blood transfusions are advised. Phototherapy and ET are administered to preterm infants according to their birth weight [16].

2. Materials and methods

2.1. Study population

There were sixty newborns in the study's sample. A single question was posed to each subject. By April-May 2025, this action should have made it easier to achieve the aforementioned objectives. Sixty male and female neonates were included; neonates with congenital defects, birth weights under 600 g, or gestational ages under 26 weeks were excluded. It is mostly senescent red cells that produce diurnal net bilirubin. Haemoglobin is converted to unconjugated bilirubin in the reticuloendothelial system; the system secretes the haemoglobin when the red cells decompose outside the body. Haemoglobin generates 600 μ mol (35 mg) of unconjugated bilirubin per gramme. Red blood cells and all other cells make up 25% of the daily bilirubin production [17].

2.2. Setting of the study

The investigation was conducted at Zahra Hospital's Education Center in the Najaf Ashraf district.

2.3. The sample of the study

Male and female neonates from Al-Zahra Teaching Hospital made up the research sample of sixty newborns.

2.4. Sample Processing

The participants were newborns with unconjugated neonatal yellowing that required phototherapy. The children were subjected to a comprehensive physical exam that included weight, serum bilirubin levels, and hemoglobin levels, these data were recorded on admission. Infants with congenital abnormalities that weighed less than 600 g, had a gestational age of less than 26 weeks, and were unable to breathe due to a lack of oxygen called perinatal hypoxia with HIE stage 3, were not considered.

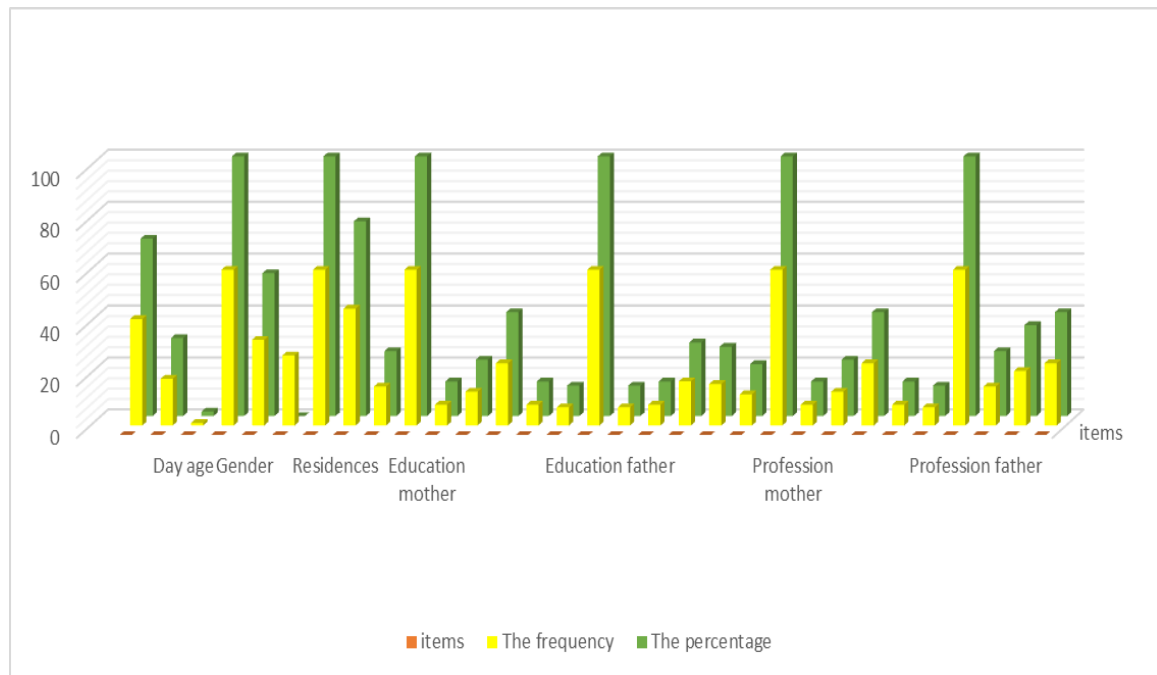


Figure 1: The study sample's distribution according to their sociodemographic attributes

3. Results and Discussion

In this study was Here is total serum bilirubin, where a notable increase in the serum bilirubin content was shown (51.6%), refer to Table 1. The age percentage is shown in Figure 1. This means that males comprised most of the participants (55%). This table shows that 75% of the participants were from non-urban areas. Also, from these figures, it can be brought to view that the percent of fathers having college education is high (28.3%), mainly in the fourth level of schooling (primary school's diploma). In comparison, 40% of the mothers had completed primary school. Statistically, it stands at 40% for the mothers. By that time, 40% employed them in the private sector. And here is the total amount of oxygen in the air, which is 60%, shown in Figure 2.

According to the study's results, the sample gender mean during the present examination was 55.0% for males, as this table demonstrates. According to the study's results, 75% of the participants were urban. In terms of age, 68.3% of the study sample was younger than 7 days [18]. For father education, the occurrence is especially noticeable in the fourth educational level (graduate primary school). The mother had just finished basic school and had no aid for higher education as she had no opportunity to continue her studies [19]. The results of the total oxygen saturation test indicated that there was 60%, which is in contrast with earlier study owing to environmental changes. The data indicated that there were non-significant differences at $P > 0.05$ Table 2, which were not substantiated by other research or studies, showing that culture varies. There was no link discovered in this analysis. Conflicting findings have arisen from cohort studies looking at the association between bilirubin and cancer incidence and mortality [20].

Table 1: Investigate the distribution of total bilirubin levels

Evaluation	Items	The frequency	The percentage
Overall Evaluation	≤ 10	15	25.0
	11 – 14	31	51.6
	15 – 18	13	21.7
	19+	1	1.7
	Total	60	100.0

Table 2: Relationship between oxygen saturation SO_2 and serum bilirubin

Variable	Items	Oxygen saturation SO_2			Total	p-value
		96-100	91-95	90 and lowest than		
serum bilirubin	≤ 10	7	7	1	15	0.596 (NS)
	11 – 14	19	7	5	31	
	15 – 18	9	3	1	13	
	19+	1	0	0	1	
Total		36	17	7	60	

The results showed that there was no statistically significant difference ($P > 0.05$).

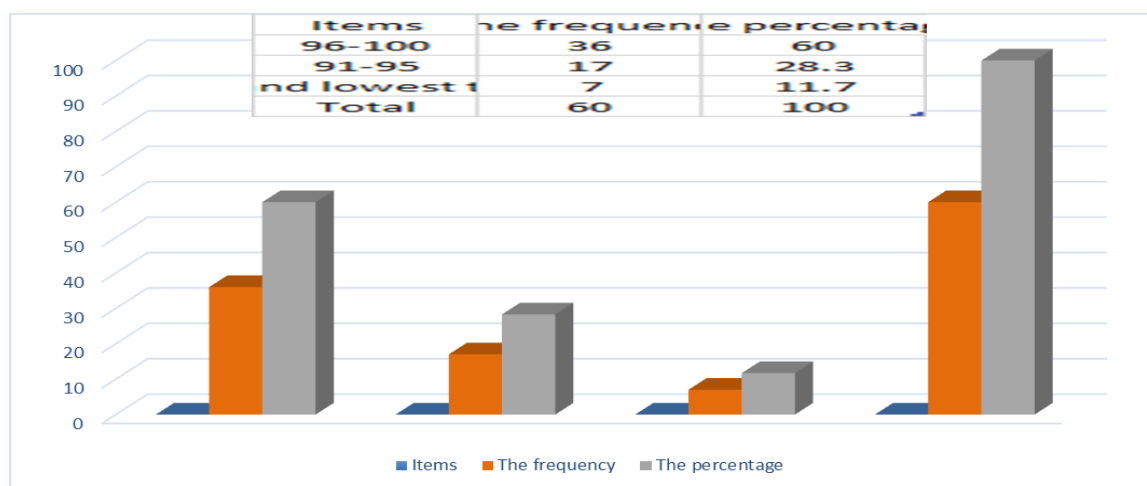


Figure 2: Assessment and scrutiny of the distribution of total oxygen saturation (symbol SO_2)

4. Conclusion

The primary level of blood bilirubin that is examined is often less. There is no influence on the measurement of total oxygen saturation, and there is no significant association between serum bilirubin and the measurement of total oxygen saturation SO_2 . The characteristics of the demographic have an effect on the entire assessment. High blood bilirubin levels are linked to the preserved function of the lungs in Israeli individuals who are exposed to high levels of air pollution.

Article Information

Ethical Approval: The study was approved by the Ethics Committee of Al-Zahra Teaching Hospital, Najaf Health Directorate, Najaf, Iraq (Approval No. 2; dated December 12, 2024).

Informed Consent: Written informed consent was obtained from the parents or legal guardians of all neonates before their inclusion in the study.

Data Availability: The datasets generated and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interest: The authors declare that they have no conflict of interest.

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Author Contributions: H.H.A. - Conceptualization, Methodology, Investigation, Data Curation, Resources, Writing – Original Draft; A.H.A. - Conceptualization, Methodology, Formal Analysis, Writing – Review & Editing, Supervision, Project Administration.

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