academicJournals

Vol. 5(7), pp. 330-334, July 2013
DOI: 10.5897/IJMMS2013.0930
ISSN 2006-9723 ©2013 Academic Journals
http://www.academicjournals.org/IJMMS

International Journal of Medicine and Medical Sciences

Full Length Research Paper

No differences in total bilirubin levels in neonates from Tzeltal, Chol and Mestizo ethnic groups in the state of Chiapas, Mexico

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Accepted 30 May, 2013

Ethnicity is an important factor for neonatal hyperbilirubinemia. This study explored total serum bilirubin levels in three ethnic groups of Chiapas, Mexico (Tzeltal, Chol and Mestizo groups). The aim of the study was to examine whether the level of total serum bilirubin is associated with any specific ethnic group. This study was conducted in 113 neonates of three different ethnic groups from Chiapas, México. Total serum bilirubin was not significantly higher in neonates of any of the three ethnic groups (p = 0.38). In addition, when we analyzed for differences between ethnic and mestizo groups, no significant differences were encountered (p = 0.20). Our results showed no significant differences in total serum bilirubin levels among three ethnic groups in a population sample from Chiapas, Mexico. However, more studies are necessary in which larger samples must be considered to determine conclusively this non association.

Key words: Bilirubin, neonates, jaundice.

INTRODUCTION

Neonatal hyperbilirubinemia affects 60% of full-term newborns and remains a significant cause of hospital readmission during the first week of life (Burgos et al., 2008; Grupp-Phelan et al., 1999; Hanchard et al., 2011). This is manifested by jaundice, the yellow-orange tint found in the sclera and skin of infants, with total serum bilirubin levels greater than 5 mg/dl (Schwartz et al., 2011). Despite the cause- and effect relationship, the terms neonatal hyperbilirubinemia and neonatal jaundice are used fairly interchangeably.

Various reports in the literature ascertain that severe neonatal jaundice is caused by isoimmune hemolytic disease (ABO and/or Rh incompatibility), infections, prematurity, low birth weight, polycythemia, closed-space bleedings such as cephal hematoma, metabolic disturbances, and intestinal obstruction. Sex, race, premature

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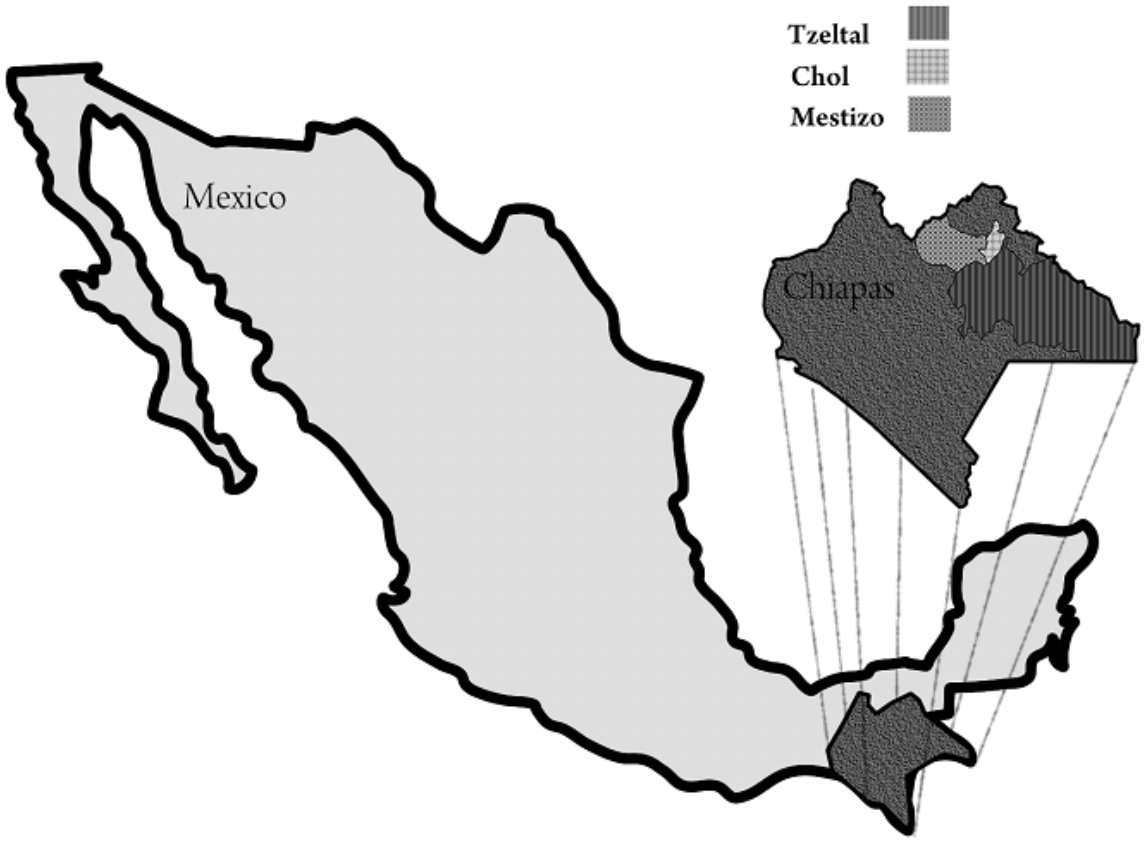

Figure 1. Map of Mexico showing the three different regions when was performed this study.

labor, insufficient fluid and caloric intake, type of delivery, premature rupture of membranes, maternal and neonatal medications and low birth weight are risk factors for jaundice. However, there are significant differences in the prevalence and severity of neonatal jaundice and hyperbilirubinemia among various populations (Setia et al., 2002; Desandre et al., 2006; Narter et al., 2011; Wasser and Hershkovitz, 2010). For example, one study reported differences in serum bilirubin levels between neonates of East Asian ancestry and European or African ancestry (Linn et al., 1985). Similarly, other study identified differences between Chinese ethnic ancestry and non-Chinese infants (Huang et al., 2009). In addition, several studies conducted in different populations have encountered that hyperbilirubinemia is associated with mutations in the gene UGT1A1 (Kadakol et al., 2000; Zhang et al., 2007; Chang et al., 2009; Carvalho et al., 2010; D'silva et al., 2012). To explore possible differences among populations, we conducted a study in three ethnic groups of the Mexican population to examine whether the bilirubin level is associated with any particular ethnic group.

METHODOLOGY

Sample

This was a prospective study conducted at the General Hospital of Yajalón Chiapas, México, during a 6-month period, starting from January, 2008. Approval for this study was granted by the bioethics committee of the General Hospital of Yajalón and the Health Ministry of Chiapas, Mexico. The initial sample consisted of 320 neonates from the General Hospital of Yajalón who were invited to participate in the study. However, only a total of 113 term neonates with ages older than 37 weeks and 2,500 g were eligible for enrollment. Hemolytic anemia, hypoxia/asphyxia, dehydration/ vomiting, cephalohematoma, sepsis, liver dysfunction, hypothyroidism were excluding criteria. Bilirubin analysis (direct, indirect and total) was determined within the first 24 h of life of the neonates. The study was performed in three different populations of the southeast of Mexico: two Indian and one urban population. Populations were identified according to Mexican National Institute of Statistic, Geography, and Informatics (INEGI) regulations (Figure 1). An urban area is defined as a settlement consisting of more than 15,000 inhabitants. An Indian population is classified on the bases of tribal language and self-declared ethnic identity. The life in rural areas has less than 2,500 inhabitants and low socioeconomic level.

Ethnia A: Tzeltal is an ethnic group that inhabits a broad

Table 1. Clinical characteristics of neonates from different ethnias.

Parameter	Tzeltal	Chol	Mestizo
Gender: male (%)/female (%)	15 (13.1) /9 (7.8)	33 (29.2)/36 (31.8)	12 (10.5)/8 (7.6)
Gestational age (weeks)	39.29±1.15	38.82±2.78	39.22±0.91
Weight at delivery (kg)	3.08±34.8	2.96±35.5	3.13±42.9
Mode of delivery: cesarean section/vaginal delivery	18 (15.9)/6 (5.3)	46 (40.7)/23 (20.4)	12 (10.6)/8 (7.1)
Apgar score at 1 min	9 (8/9)	9 (8/9)	9 (8/9)
Apgar score at 5 min	10 (10/10)	10 (10/10)	10 (10/10)

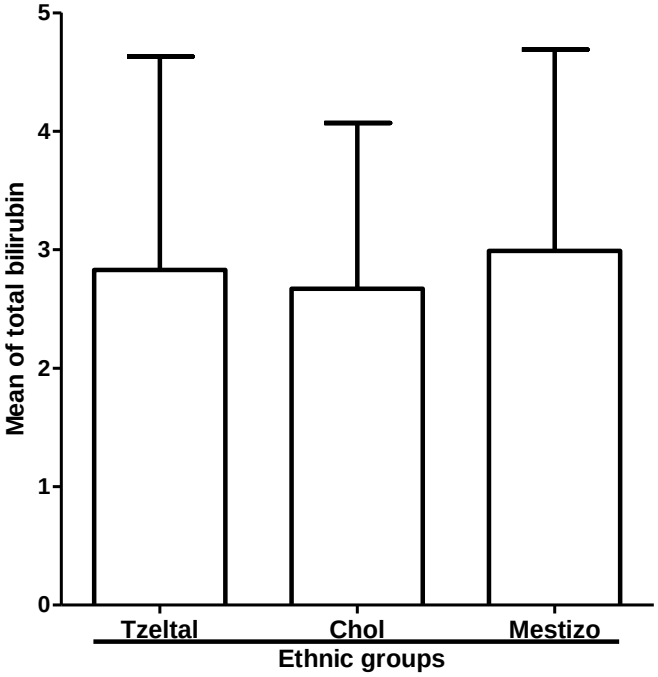

Figure 2. Mean and standard deviation of total bilirubin level Tzeltal, Chol and Mestizo groups living in Yajalón, Chiapas, México.

geographic area in southeast Mexico. The region extends across several municipalities of Chiapas. We selected mainly three municipalities: Yajalón, Chilón and Bachajón. This indigenous group lives in small villages, or pueblos, located in mountainous terrain with difficult access (900 meters above sea level on average). This group speaks its own particular dialect. Twenty four neonates from these three municipalities whose mother tongue was Tzeltal, were included.

Ethnia B: Chol; currently, this indigenous group lives in many municipalities of the states of Chiapas and Tabasco in Mexico. However, we studied neonates whose mothers live in semi-urban or rural locations of Tumbala and Tila municipalities in which Chol is their native tongue. Sixty nine neonates were included.

Group C: Mestizo; a third group constituted of 20 neonates whose mothers lived in the city of Yajalón. The inhabitants of Yajalón are mostly Spanish-speaking subjects who are considered mestizos. In this group, we wanted neonates whose mothers lived in urban settlements.

Bilirubin determination

Quantitative determination of total bilirubin concentration was performed in blood serum using a Beckman synchron analyzer according to previously published methods described elsewhere (Abdel Ghany et al., 2012)

Statistical analysis

The data are described as number and percentages for qualitative variables and as mean and standard-deviation for quantitative variables. A general linear model analysis of variance (ANOVA) was performed to identify differences in the quantitative variables of interest. Independent sample t-tests were used to compare ethnic and mestizo groups. The level of significance was set at $p < 0.05$.

RESULTS

Among the 113 neonates who participated in this study, 60 were male and 43 female. The mean gestational age was 38.98 weeks with a standard deviation (SD) of 2.27. Of these, the mean weight at delivery was 3.020 kg with an SD of 37.15 g. Demographic parameters and total bilirubin levels in the study groups are shown in Table 1, according to their socioeconomic characteristics. The mean of total bilirubin level for the Tzeltal, Chol and Mestizo groups was 2.83 ± 1.8, 2.67 ± 1.4, and 2.99 ± 1.7 mg/dl, respectively (Figure 2). Differences between groups were not significant ($F = 0.29$, $p = 0.38$). Therefore, we investigated the existence of a potential difference between ethnic and mestizo populations. However, significant differences were not observed (mean of Tzeltal and Chol groups: 2.72 ± 0.16 mg/dl, $t = 0.67$, $p = 0.20$). Finally, as well as a not significant correlation between the level of total bilirubin and gender, gestational age and weight at delivery was encountered ($p > 0.05$) (Table 2).

DISCUSSION

To examine the level of bilirubin is essential, since this

Table 2. Correlation between at level of total bilirubin and gender, gestational age and weight at delivery.

Parameter	Pearson´s correlation	Significance (2-tailed)
Gender	-0.59	0.539
Gestational age	-0.049	0.60
Weight at delivery	0.003	0.97

information can predict cerebral palsy (chroreoathetotic type), sensorineural hearing impairment, psychological impairment, and disturbances of visual perception (Chen et al., 2006). In addition, it has been recently described that neurological damage due to severe neonatal jaundice is increasing mainly to early discharge from the hospitals (Gazzin and Tiribelli, 2011). Chol and Tzeltal populations live in mountainous terrain with difficult access, so neonates are readmitted to hospitals only after severe jaundice. Therefore, we wanted to identify whether there was a group of major risk for severe neonatal jaundice in this region of Mexico.

In this study, we explored total bilirubin levels in three ethnic groups in the Mexican population. To our knowledge, this is the first report assessing differences in total bilirubin levels among ethnic groups in southeast Mexico. The three groups selected have differences in culture, including lifestyle, diet and possibly gene structure. However, we encountered no significant differences in the level of total serum bilirubin among the three ethnic groups. There are some possible explanations to account for this finding. First, the size of the sample was small. We observed that most of the parents in these populations refused to have their children enrolled in the study; hence future studies must include larger samples to determine more conclusively possible differences among these ethnic groups. Second, the sample could consist of a homogeneous population. One study, analyzing the frequency of the *UGT1A1* promoter gene in a sample from 14 states of Mexico did not find significant differences (Arambula and Vaca, 2002). However, this study included Mexican mestizos and did not analyze any ethnic group in particular.

It has been well documented that differences in development exist according to the various ethnic groups with respect to total serum bilirubin. For example, there are differences between black and white infants in the United States. Black infants as a group exhibit lower levels of total serum bilirubin than white infants (Newman et al., 1990). Similarly, differences have been reported between neonates of East Asian ancestry and European or African ancestry (Linn et al., 1985), or between white and mixed East Asian infants (Setia et al., 2002). Conversely, we could not find differences in total bilirubin levels among the three ethnic groups in the population of Chiapas, Mexico.

In the same form, we analyzed if the level of bilirubin could be associated with gender, mode of delivery or gestational age. However our analysis revealed no significant difference. Previous studies have reported these not to be related (Chang et al., 2009; Chen et al., 2006). One possibility is what the level of bilirubin is associated with; other factors could be genetics or clinic condition. Finally, this study has some limitations. First, we did not perform follow-up studies of the neonates studied. Second, we did not go to the communities to enroll the neonates included in this study, we only included neonates of mothers that came to the hospital for medical care. Finally, we did not consider sociodemographic factors such as the diet or lifestyle.

Conclusion

We did not find differences in total serum bilirubin concentration among the three ethnic groups of Chiapas, Mexico. Similarly, we did not encounter differences between the ethnic and mestizo populations. This outcome suggests that the level of total serum bilirubin may not be associated with a particular ethnic group. However, further studies must analyze this non association in larger samples in these and other ethnic groups of Mexico.

ACKNOWLEDGMENT

This work was supported by Hospital General Hospital of Yajalón. The authors are grateful to all the participants in this study.

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