Iodine nutrition status amongst neonates in Kangra district, Himachal Pradesh

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Abstract

Iodine deficiency (ID) is an endemic [health problem](https://www.sciencedirect.com/topics/medicine-and-dentistry/disease) in Kangra district, Himachal Pradesh (HP) state. ID leads to [mental retardation](https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/intellectual-disability), deaf mutism, squint, dwarfism, [spastic diplegia](https://www.sciencedirect.com/topics/nursing-and-health-professions/cerebral-palsy), neurological defects and congenital anomalies. Iodine nutrition status amongst neonates can be assessed by estimating [thyroid stimulating hormone](https://www.sciencedirect.com/topics/medicine-and-dentistry/thyrotropin) (TSH). The present study was conducted with an objective to assess the iodine nutrition status amongst Neonates in Kangra district, HP. All of the hospitals in the district which provide [obstetric services](https://www.sciencedirect.com/topics/nursing-and-health-professions/maternity-ward) were enlisted, of which three were selected for this survey. A total of 613 umbilical cord blood samples of neonates were collected on filter paper and analyzed for TSH. WHO (2007) reported that that a <3% frequency of TSH concentrations above 5 mIU/L in samples collected 3–4 days after [birth](https://www.sciencedirect.com/topics/medicine-and-dentistry/childbirth) indicates iodine sufficiency in a population. In our study we found that 73.4% of the neonates had TSH levels of more than 5 mlU/l, thus indicating ID in the population studied. Iodine deficiency continues to be a public [health problem](https://www.sciencedirect.com/topics/medicine-and-dentistry/disease) in Kangra district, Himachal Pradesh.

Introduction

Iodine deficiency disorders (IDD) is a serious global public health problem estimated to affect about one billion people across the world [1]. ID in neonates leads to cretinism including mental deficiency with a mixture of mutism, spastic diplegia, squint, hypothyroidism and short stature. Iodine deficiency amongst neonates lowers circulating thyroxin level and raises serum TSH. Hence, iodine deficient neonates have higher serum TSH concentration than do iodine sufficient neonates. In iodine-sufficient populations, about one in 4000 neonates may have congenital hypothyroidism, usually because of thyroid dysplasia. Thyroid stimulating hormone affects proper development of the central nervous system, particularly its myelination [2].

Kangra district, HP is a known endemic region for ID. The salt iodization programme in Kangra district was initiated in 1962, and thus has been running for over 50 years. Studies are available on the status of iodine nutrition in School Age Children (SAC) during the iodization programme which has documented the prevalence of ID as 12.1% (1999), 19.8% (2007) and 15.8% (2013), respectively [3], [4], [5]; however, there is a lack of data on the status of iodine nutrition amongst neonates from this district. The present study was conducted with an objective to assess the iodine nutrition status amongst neonates in Kangra district, HP, with an aim to provide evidence to state health authorities to strengthen the IDD programme, if required.

Section snippets

Materials and methods

The study was carried out from May 2013–July 2013. In Kangra district a total of nine Hospitals/Community Health Centres which conducted more than 100 deliveries per annum were selected. Of these, three hospitals were randomly selected. The 613 births occurring consecutively in these three hospitals during the study period were included for estimation of iodine nutrition amongst neonates. The blood samples were collected after the written consent of the mothers (of the neonates). The umbilical

Umbilical cord blood collection

Cord blood was collected before placental delivery within five minutes after birth to avoid clotting. One drop of blood was applied to filter paper. The spots were dried at room temperature and the filter papers were sealed and kept in a freezer until assayed in the laboratory. The samples were stored at 4 °C before analysis.

The samples were estimated for TSH by using sandwich enzyme linked immuno-sorbent assay (ELISA) method. Dry blood spots were eluted in anti-TSH antibodies coated with micro

Sample size

Keeping in view the anticipated prevalence of 2.9% [9], a confidence level of 95%, absolute precision of 2.0 and a design effect of 2, a total sample size of 541 was calculated. However we studied a total of 613 subjects.

Statistical analysis

The TSH normality and abnormality was compared in gender by using chi-square test.

Results

A total of 613 umbilical cord blood samples of neonates (324 males and 289 females) on filter papers were collected and analyzed for TSH. Three hundred and thirty six (54.8%) samples had TSH level of <10 mlU/l, 217 (35.4%) had 10 to <20 mlU/l and 60 (9.8%) had ≥20 mlU/l. It was also found that 73.4% of the neonates had TSH levels of more than 5mlU/l, thus indicating prevalence of ID in a population studied. No statistically significant difference of gender on the TSH levels was observed.

Discussion

Neonates are the most vulnerable group for ID. Raised TSH in neonates is an indicator for ID. WHO (2007) reported that a <3% frequency of TSH concentrations above 5 mIU/l in samples collected 3–4 days after birth indicates iodine sufficiency in a population [2]. In the present study 73.4% of the neonates have TSH levels of more than 5mlU/l, thus indicating widespread presence of ID. This could be possibly due to higher percentage of families consuming salt with iodine content of less than 15 ppm

Conflict of interest

The authors declare no conflict of interest.

Acknowledgment

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