Jain et al (1998) have found that 55% of preterm neonates and 30% of full- term neonates developed hypocalcemia after phototherapy. There was a statistically significant ($p < 0.05$) difference in the serum calcium level. This study was in correlation with our study where the incidence in preterm found to be 41.2%.[15]

Sourabh Dutta (2001) concluded that 90% of preterm neonates and 75% of fullterm neonates developed hypocalcemia after being subjected to phototherapy. [16]

Karamifar et al (2002) found that prevalance of hypocalcemia was 22.6% in preterm neonates and 8.7% ($p=0.018$) in full term neonates after phototherapy. This risk was greater in premature neonates. This study was in correlation with our study where the incidence in term found to be 6.2%.[17]

Eghbalian study found statistically significant difference ($p<0.05$) between pre- and post-phototherapy plasma calcium levels in term neonates. [19]

Yadav RK et al (2011) found a significant fall ($p<0.05$) in calcium level in 66.6% of term and 80% of preterm neonates after 48 hours of phototherapy. [20] Taheri et al (2013) studied the prevalence of phototherapy induced hypocalcemia in 147 term neonates and found decrease in serum calcium level in 56% babies out of which 7% developed significant hypocalcemia ($p=0.03$) after 48 hours of phototherapy. [21]

Arora et al (2014) study concluded that hypocalcemia was more frequently observed in term neonates as compared to preterm neonates which was in contrast to our study. Higher incidence of hypocalcemia in term group in Arora et al study was probably attributed to higher cut off value of serum calcium level of 8mg/dl as compared to 7mg/dl in preterm babies. [22] The incidence of hypocalcemia in the above study was 43% in preterm neonates which was in consonance with our study.

Much higher incidence of hypocalcemia was observed by Sethi et al and lowest incidence was reported by Karamifar H et al. The reason for this difference is not very clear but can be explained by the lower number of study groups taken in the other studies.

In our study, hypocalcemia occurred more frequently after 48 hrs of continuous phototherapy which was similar to Arora et al study. Symptomatic hypocalcemia was observed in Sethi et al[14], Jain et al[15] and Arora et al[22]

In the present study, it was observed that phototherapy induces considerable decline in serum calcium level in icteric newborn therapy and this decline may continue down to the threshold of hypocalcemia but was not accompanied by signs and symptoms found in hypocalcemia such as jitteriness, apnea, cyanosis and or convulsion which was in comparison to Karamifar et al study.

Table 14: Comparison of mean serum calcium levels before and after phototherapy in preterm neonates with other study

Study	Mean±SD serum calcium level		p value
	Before phototherapy (in mg/dl)	*After phototherapy (in mg/dl)*	
Karamifar et al[17]	8.73±1.38	8.40±1.71	0.039
Our Study	9.10±1.13	7.96±1.34	<0.001**

In our study mean serum calcium level before and after phototherapy in preterm neonates was 9.10±1.13mg/dl and 7.96±1.34 mg/dl respectively. There was a significant decline in the mean calcium level following phototherapy ($p<0.001$). This was similar to the study done by Karamifar et al with significant p value 0.039.

Table 15: Comparison of mean serum calcium levels before and after phototherapy in term neonates with other studies

Study	Mean±SD serum calcium level		*p* value
	Before phototherapy (in mg/dl)	After phototherapy (in mg/dl)	
Eghbalian et al[19]	9.85±1.23	9.09±0.93	<0.001
Karamifar et al[17]	9.53±0.92	9.30±1.11	0.043
Taheri et al[21]	9.8±0.80	9.5±0.90	<0.05
Our Study	9.32±0.97	8.82±1.04	<0.001**

In our study there was a significant decline in mean serum calcium level following phototherapy in term neonates also ($p<0.001$) which was similar to the other studies done by Eghbalian et al[19], Karamifar et al[17] and Taheri et al[21]

B. Phototherapy induced other electrolyte changes

There are very few studies regarding phototherapy induced other electrolyte changes. The differential effect of other electrolytes with phototherapy has not been studied by other workers except that for Curtis MD et al (1981) study which stated that absorption of water, sodium chloride, and potassium was significantly impaired in the patients receiving phototherapy. [13]

Incidence of hyponatremia in our study group was 6% and found to be higher in <37 wks group (17.6%) and LBW babies (17.2%) than in >37 wks group (3.1%) and normal weight babies (2.6%). Mean serum sodium levels were significantly decreased after phototherapy. As the P value <0.001, this difference is considered to be statistically significant.

There were no significant potassium or chloride changes in our study. Tan KL et al[23] (1981) study in healthy full term neonates demonstrated a transient raise in potassium levels after phototherapy which was in contrast to our study.

It is evident that in the present study phototherapy induced hypocalcemia and hyponatremia was more in preterm and LBW babies but the actual relationship in these babies with phototherapy has to be evaluated with larger sample studies for estimation of the incidence as the metabolic side effects are more common in preterm and LBW babies.

6. Conclusions

Incidence of hypocalcemia in our study group is 13.1% and is higher in preterm (41.2%) and low birth weight babies (36.2%) than in >37weeks gestational age group (6.2%) and normal weight babies (6.2%). Incidence of hypocalcemia following phototherapy is higher when the duration of phototherapy is more than 48 hours when compared to less than 48 hours. Mean Serum calcium levels were significantly decreased after phototherapy. Incidence of hyponatremia in our study group is 6% and is higher in preterm (17.6%) and low birth weight babies (17.2%) than in >37 weeks group (3.1%) and normal weight babies (2.6%). Incidence of hyponatremia following phototherapy is higher when the duration of phototherapy is more than 48 hours when compared to less than 48 hours. Mean Serum sodium levels were significantly decreased after phototherapy. There are no significant changes in potassium and chloride levels following phototherapy. Preterm neonates and low birth babies are at higher risk and hence this group of babies should be closely monitored. Proper monitoring of electrolytes after phototherapy in the neonates can prevent dyselectrolytemia, in turn prevent the related complications.

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