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IS SEVERE RETINOPATHY OF PREMATURITY A DISEASE OCCURRING IN PRETERM INFANTS FROM ALL SOCIOECONOMIC CLASSES? A CASE CONTROL STUDY FROM WESTERN INDIA.

ophthalmology

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ABSTRACT

Background: Retinopathy of Prematurity particularly its severe form is emerging as a leading cause of childhood blindness in India and affects preterm low birth weight infants. Socioeconomic class of the parents can play an important role in the health outcome of a child.
Purpose: This study was conducted to find out association between socioeconomic class of parents and occurrence of severe ROP.
Methods: This case control study was conducted in a tertiary eye care center in western India in 2013 and subjects were recruited from the ROP screening program of the hospital. Cases were defined as preterm low birth weight infants with diagnosis of 'Severe ROP' and remaining infants served as controls. Socioeconomic data based on Kuppuswamy scale were collected of each parent. Statistical analysis including multiple logistic regression was performed.
Results: Total 44 cases and 104 controls could be enrolled for the study. There was no statistically significant association between any of the socioeconomic class and severe ROP (P- 0.4).
Conclusion: Socioeconomic status of the parents is not associated with severe ROP in preterm low birth weight infants.

KEYWORDS

Retinopathy of Prematurity; Socioeconomic class

Introduction:
Retinopathy of prematurity (ROP) is a potentially blinding vascular disorder of the retina seen in preterm low birth weight infants. It is emerging as an important cause of childhood blindness in middle income countries such as India. Blindness due to ROP is irreversible but largely preventable with timely screening and treatment. This blindness has been largely controlled in developed economies such as western Europe and north America owing to excellent neonatal care practices and universal screening. In middle income countries such as India, ROP is emerging as an important cause of childhood blindness and this is termed as 'third epidemic' of ROP (1, 2). Low birth weight (BW) (2 kg or less), low gestational age (GA) (34 weeks or less) are the most strongly associated risk factors for ROP and Indian guidelines suggest universal screening for ROP (3). Risk factors such as pulmonary disease, sepsis, anemia, blood transfusion, neonatal jaundice requiring phototherapy, multiple pregnancy, poor weight gain and many others are also known to be associated with ROP (4-10). In addition to these, unmonitored supplemental oxygen and poor quality of neonatal care can lead to high incidence of ROP. Quality of neonatal care in India is variable ranging from excellent to very poor depending on the setting (urban/ rural, private/ public sector) and can play a significant role in development of severe ROP in a child (2).

Incidence of ROP in India is reported to be between 22-46% among all preterm low birth weight children and about 7-10% of the these 'at risk' infants develop disease severe enough to require laser treatment (4, 6, 11). Infants developing 'severe' ROP are most likely to turn blind in the absence of treatment. Most infants require multiple screening sessions before decision about discharge/ treatment can be taken. Outcome of timely treatment is often excellent saving these infants from lifetime of blindness (12-14).

A burgeoning volume of research identifies social factors at the root of much of the inequalities in health outcomes (15). Socio-economic status of the family could also be a major determinant of perinatal health outcomes in a child. Education and economic status of parents could affect their health seeking behavior and hence the care a preterm child may receive. In India 60% of the inpatient care is provided by private sector (16). In a private Neonatal Intensive Care Unit (NICU) where there is fees for the service, sick babies are likely to get better quality of care with close monitoring owing to optimal human resource. Parents from lower socioeconomic strata are likely to seek care in free public facilities which are often constrained for human and other resources (17). This may have implications on the quality of care a preterm child may receive and the health outcomes such as ROP. On the other hand ROP resulting in 'lifetime of blindness' in a preterm infant can have great socioeconomic impact on the family further pushing the family into cycle of poverty. To the best of the authors' knowledge, there has not been any published study exploring association of socio-economic factors and severe ROP. This study was undertaken to find association between severe ROP and education, occupation and socioeconomic class of the parents.

Material and Methods:
This case control study was conducted in a tertiary eye care center situated in an urban metropolitan area of western India in 2013 (June-August) after approval from the institutional ethics committee. Written informed consent was obtained from one of the parents after explaining the purpose of the study. The study abided by the tenets of Helsinki.

Parents of children enrolled in ROP screening program of the study hospital were invited to participate when they visited study hospital for follow up screening. The decision to enroll a particular child was taken after final action plan for that child (whether laser treatment was required or the child was to be discharged from follow up screening) was decided. The population of preterm children came from multiple NICUs (both public and private sector).

Cases and controls:
Cases were defined as preterm children with diagnosis of 'Severe ROP' (those at risk of blindness or severe visual impairment). Severe ROP required treatment in the form of laser surgery. Controls comprised of preterm infants who did not develop severe ROP (hence not at risk of blindness and not requiring treatment).

International Classification of ROP was used for diagnosis (18). Guidelines from Early Treatment for ROP (ETROP) (19) group were used to decide whether treatment was required or not for a particular child.

Sample size calculation:
To calculate the sample size, it was assumed that 70% of cases would belong to lower socioeconomic class compared to 40% controls. To achieve 95% confidence interval and 80% power to detect the difference, 45 cases were needed. Two controls were recruited for each case. Both cases and controls were recruited from the infant population enrolled in ROP program of the study hospital when they visited the

study hospital for follow up visits. The cases and controls came from both private and public sector NICU). Equal distribution of cases and controls between private and public sector was ensured to minimize selection bias.

Data on socioeconomic variables were collected by field staff who were not aware of the study hypothesis. This was ensured to minimize information bias. Data were collected on each parent's education, occupation and monthly family income. Kuppuswamy socioeconomic scale was used to classify family into one of the 5 socioeconomic classes (20). This scale takes into account education, occupation, family income to calculate the socioeconomic class based on the total of score (ranging from 0-29) allocated for each level. The socioeconomic class might range from lower to upper depending on the score calculated. For analysis purpose education, occupation, socioeconomic class were divided into 2 categories as shown in Table1.

Table 1: Categories of socioeconomic variables

Variables	*Category 1*	*Category 2*
Education	high school or less	More than high school
Occupation	skilled worker or less	More than skilled worker
Socioeconomic class	Lower middle or lower	Upper middle or higher

Category 1 (Lower middle or lower class, score <15) was considered as the 'exposure' or 'risk factor' for severe ROP. Category 2 (score 16 or more) was upper middle or upper class.

Data on potential confounders such as birth weight, gestational age, any illness during NICU stay (such as oxygen supplementation, sepsis, respiratory distress syndrome, anemia, blood transfusion etc) were collected. All the data were entered in a Microsoft excel sheet and analyzed using a statistical software (SSPS). Odds ratio (OR) for each of the socioeconomic variables of mother and father were calculated using Pearson's chi square test. Multiple logistic regression analysis was done for calculating Odds ratio after taking into account effect of confounding variables. The variables used for multiple logistic regression analysis were- GA, BW, oxygen supplementation, respiratory distress syndrome, sepsis, anemia, blood transfusion, apneic spells, phototherapy for neonatal jaundice. All of these are known to be risk factors for development of ROP.

Results:

Total 44 cases (private: public sector= 1:1) and 104 controls (private sector-51, public sector-53) could be recruited for the study.

Males constituted 54.5% (24/44) of cases and 51.9% (54/104) of controls.

Mean GA in cases was 29.6 weeks (range 25 - 34) whereas that in controls was 31.2 weeks (range 28 - 35).

Mean BW recorded in cases was 1157 grams (range 692 -1925), whereas that recorded in controls was 1376 grams (range 700 - 2310).

Association between Mother's education and severe ROP:

Table 2 shows distribution of cases and controls by mother's education.

Table 2: Association between mother's education and severe ROP

	High school or less (%)	More than High school (%)	Total
Cases	38 (33.6)	6 (17.2)	44
Controls	75 (66.3)	29 (82.8)	104
Total	113 (100)	35 (100)	148

(P- 0.06)

Odds Ratio (OR) for occurrence of severe ROP in preterm children belonging to mothers educated up to high school or less was 2.4 (95% CI 0.9-7.8), (P- 0.06).

Multiple logistic regression analysis for association between mother's education and severe ROP after accounting for other risk factors for ROP showed an attenuated OR of 1.4 (0.6-14.5, P- 0.1).

Other socioeconomic variables such as father's education, occupation, mother's occupation did not show any association with severe ROP.

Distribution of cases and controls by socioeconomic class is shown in Table 3.

Table 3: Association between socioeconomic class and severe ROP

Case/ Control	Lower middle or lower class (%)	Upper middle or upper class (%)	Total
Cases	33 (31.7)	11 (25)	44
Controls	71 (68.3)	33 (75)	104
Total	104 (100)	44 (100)	148

Discussion:

Kuppuswamy's socioeconomic scale has been successfully used in the past to determine risk factors of various diseases in children (21-23). This scale was used to explore association of socioeconomic factors and corneal pathologies needing keratoplasty by Dada et al (24). To the best of authors' knowledge, attempt to link this scale to ROP is being done for the first time.

There was some suggestive evidence that preterm children whose mothers were educated up to high school or less were 2.4 times more likely to have severe ROP. This could be because an educated mother is more likely to be aware or perceptive towards health care practices such as hand washing before touching the child, breast feeding etc. These practices are known to reduce the risk of severe ROP by preventing illness in a preterm child. Better the general health of the child, less is the risk of ROP. Educated mother is also likely to be different in her health seeking behavior and more likely to come back for follow up screening. However, the association of severe ROP with mother's education attenuated after taking into account effect of other risk factors for ROP. Similarly socioeconomic class of the parents and severe ROP did not show statistically significant association.

Conclusion:

Occurrence of severe ROP among preterm children in urban metropolitan area of western India is not associated with socioeconomic status of parents. Children born to parents from both lower as well as upper socioeconomic class are at equal risk of developing severe ROP and hence blindness.

Recommendation:

The authors recommend that every preterm low birth weight child be screened for ROP. Although risk of severe ROP is similar in all social classes, children born to parents from lower socioeconomic classes are more likely to turn blind owing to barriers such as cost, lack of awareness. Strategies to serve all classes such as establishing ROP screening programs in Public sector NICUs need to be formulated.

Limitations:

There are certain limitations of this study. The study population came from an urban metropolitan city where coverage and access to health facilities is better than that in rural areas. Hence the findings of this study may be biased and not generalizable. A similar study conducted in rural areas where neonatal care has been expanding rapidly in the past decade might have fetched different results especially due to stark differences in socioeconomic status of people living in urban and rural India. Mothers with poor socioeconomic status are likely to have low maternal weight gain, suffer from anemia, less likely to have hospital delivery therefore increasing chances of early death of the child before development of severe ROP. There is also a possibility that parents from lower socioeconomic class may miss screening for ROP on account of various barriers such as lack of awareness, distance, cost, transport etc. Such children may not be detected despite having severe ROP. These factors could likely have resulted in underestimation of the strength of association between socioeconomic class and severe ROP. Wider confidence intervals indicate that sample size was small. Study with larger sample size is required to confirm association of socioeconomic status of family and severe ROP in a preterm child.

Relevance:

This study reemphasizes the fact that severe ROP can occur in any preterm low birth weight infant irrespective of the socioeconomic class of the parents. This assumes importance especially in rural area where families are more likely to belong to lower socioeconomic class. Establishing screening programs in rural areas and public sector NICUs where parents from poor economic background are likely to seek care needs to be prioritized.

Author Contribution:

SK- Concept, Design, Data collection, analysis, interpretation, manuscript writing.
RK- Design, Data analysis, interpretation, critical review of the manuscript
KD- Concept, design, critical review of the manuscript
PN- Data Collection, analysis, interpretation
MD- Critical review of the manuscript

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