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To Analyze the Association between Socio-Demographic Variables and Prescription of Anti-Epileptic Drugs in Children with Epilepsy

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Abstract

Background:-Epilepsy has significant economic impact in terms of health-care needs and premature deaths. Access to medical care differs among socio-economic groups but less in known about inequalities in epilepsy care within a country. **Objective**: To analyze the association between socio-demographic variables and prescription of anti-epileptic (AED) drugs in children with epilepsy. **Method**: An observational-cross sectional study was done over the period of 6 months in department of Pediatrics, Rajindra Hospital attached to Government Medical College, Patiala, Punjab. Data on epilepsy, AED prescription and socio-demographic variables, wascollected from 50pediatric patients of epilepsy aged 1-17 years.Chi square test used for statistical analysis. **Results**: Among study population (n=50), male children (58%) were more than female children (42%). Children aged 1-6 years (n=12) were mostly treated with mono-therapy (20%) where most commonly prescribed drug was sodium valproate (14%),and rarely with poly-therapy (4%).Children aged ≥6-17 years (n=38) were treated with both poly-therapy (44%) and mono-therapy (32%). There was significant difference in prescribing pattern between two age groups i.e. 1-6 years vs ≥6-17 years (p = 0.013). Access to poly-therapy was greater in children belonging to middle class family, as compared to those belonging to lower class family and the difference was statistically significant (p = 0.015). **Conclusion**: There is wide inequality in health care services in terms of AED prescription pattern between different socio-economic classes. Every individual should be provided with good quality health care regardless of his/her socio-economic status. There should be equal treatment for individuals with equal need.

Keywords:Epilepsy, Antiepileptic Drugs, Socio-Demographicvariables, Socioeconomic Status Scale.

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INTRODUCTION

Epilepsy holds 0.5% of global burden of disease, a time-based measure that combines years of life lost due to premature mortality and time lived in less than full health.[1]It is estimated that 0.5-1% of all children have epilepsy, with the majority presenting during infancy or early childhood.[2]There are more than 12 million people with epilepsy in India, contributing nearly one sixth of global burden.[3] Approximately 4-10% of children experience at least 1 seizure (febrile or afebrile) in the 1st16 year of life and 5% of children during 1st 5 year of life.[3] The incidence rate vary from 0.2 – 0.6 per 1000 population.[3] In India, prevalence rate for epilepsy is 5.59 per 1000 population.[4]

Epilepsy has significant economic impact in terms of health-care needs and premature deaths.[4]The economic impact of epilepsy varies significantly depending on the duration and severity of the condition, access to medical care, response to treatment, and the health-care setting.[5]

Access to medical care differs among socio-economic groups but less in known about inequalities in epilepsy care within a country.[5] Health equality can be defined as the absence of systematic disparities in health between more and less advantaged social groups or absence of health inequalities that are unjust or unfair.[5] In many countries, especially the developing countries, like Zambia, Liberia, Malawi, Ethiopia. Sierra Leone, Tanzania, Somalia, etc. there is evidence of wide inequalities in the utilization of health services as well as the presence of inverse care law: those with the greatest need for health services are not getting a fair share from health services.[6]Inequalities in terms of health may include differences in health outcomes, or access to health care across racial, ethnic, sexual orientation and socio-economic groups.[5] Equality is an ethical principal, closely related to human rights principle. Patients should be provided with the necessary anti-epileptic drugs, regardless of their socio-economic belongings.

The first step is to identify the existing disparities so as to enable the health care system to take actions for unnecessary inequalities.We studied whether the socio-demographic variables affect the provision of specialized health care for children with epilepsy. The present study was conducted to analyze whether the prescription of antiepileptic drugs (AEDs) differ with socio-demographic variables in children with epilepsy in our region?

An observational,cross sectional study was conducted in the Pediatric department of Government Medical College and RajindraHospital, Patialaafter the approval from Institutional Ethics Committee as the approval NO. TRG.9(310)/2019/2257. The study was registered with CTRI as the registration no.:

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CTRI/2019/10/021684 and conducted over a period of 6 months from 3rd November,2019 to 2nd May, 2020.

STUDY POPULATION: Among all the pediatric patients with seizures, a total of 50 patients of either gender and age 1- 17 years with primarydiagnosis for epilepsy [International Classification of Diseases, Tenth Revision (ICD-10) codes],[7] and/or child with epilepsy with at least one prescription of an AED during the specified time period, were included in the study. Any patient of age < 12 months or > 17 years, or who had status epilepticus, or seizures associated with paralytic stroke, trauma, malignancy, or children with uncertain diagnosis, or children who had pathological liver disease and renal disorder, or children who refused to give assent or parents not willing to give consent, were excluded from the study.

STUDY PROCEDURE:The data collection steps include:

- Preparation of protocol of the study
- Preparation of simple questionnaire
- Compilation of entire data
- Interpretation of data

All the pediatric patients of age group 1-17 years coming to the Pediatric department were screened according to inclusion/exclusion criteria. Patients eligible for the study were enrolled after explaining the purpose of the study. Informed consent/verbal assent was obtained from guardian/children. Detailed information was collected on patient's age, gender, place of birth, residence, prescription of AEDs, and socio-economic variables. The data was analyzed to examine whether the prescription of AEDs in pediatric epilepsy differ according to gender, age, parental education, place of residence, and household income.

SOCIO-ECONOMIC VARIABLES:Modified Kuppuswamy's socio-economic status (SES) scale 2019 was used to determine the socio-economic status.[8] It included 3 index parameters –educational status of the head of family, occupational status of the head of the family and overall income of the whole family.The income scale in the Kuppuswamy SES is revised.[8]The total score of Kuppuswamy SES ranges from 3-29 (Table 1), and classifies the families into 5 groups.

Table - 1. Kuppuswamy socio-economic status (SES) scale

S. No.	Score	Socioeconomic class
1.	26-29	Upper (I)
2.	16-25	Upper Middle (II)
3.	11-15	Lower Middle (III)
4.	5-10	Upper Lower (IV)
5.	< 5	Lower (V)

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ANALYSIS AND STATISTICS:Chi square was used to test the statistically significant difference in categorical data. For all the statistical tests performed, *p* value less than 0.05 ($p<0.05$) was considered statistically significant.

RESULTS

A total of 50 children with epilepsy, taking anti-epileptic drugs, were taken into study(Table2).

Table-2. Demographic characteristics of study population

Domain	Variable	Patients	Percentage
Age (years)	1-6 Years	12	24%
	≥ 6-17 Years	38	76%
	Total	50	100%
	Mean±SD	10.05±4.52	
	Median	11.00	
	Range	1-17	
Gender	Female	21	42%
	Male	29	58%
	Total	50	100%

Gender wise distribution:-Boys were found to be higher (58%)than girls (42%). Polytherapy was commonly prescribed in boys (30%)as compared to girls (14%) (Table 3).But, there was no statistically significant difference in prescribing pattern of AEDs between boys and girls ($p = 0.196$).

Table-3. Prescription pattern of AED according to gender of study population

Gender	AED	Patients	Percentage	X^2	p value
Female	Monotherapy	14	28%	1.67	0.196 (NS)
	Polytherapy	7	14%		
Male	Monotherapy	14	28%		
	Polytherapy	15	30%		

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	Total	50	100%		

Age wise distribution:-The no. of children in age group ≥6-17 years were found to be more than 1-6 years age group.Younger children(aged 1-6 years) were most commonly prescribed with mono-therapy (20%) viz. sodium valproate. Less commonly given was levetiracetam. Older children(aged ≥6-17 years) were commonly treated with poly-therapy(44%) (Table 4). Most commonly prescribed combination was sodium valproate with clobazam, followed by sodium valproate with levetiracetam and levetiracetam with clobazam. Mono-therapy includes sodium valpraoteorlevetiracetamor zolpidem. There was statistically significant difference in prescribing pattern between two age groups i.e. 1-6 years vs ≥6-17 years (p=0.013).

Table-4. Prescription pattern of AED according to age group of study population

Age (Years)	AED	Patients	Percentage	X^2	p value
1-6	Monotherapy	10	20%	6.21	0.013 (S)
	Polytherapy	2	4%		
≥ 6-17	Monotherapy	16	32%		
	Polytherapy	22	44%		
	Total	50	100%		

Socio-economic status: Based on socio-economic status of families of children, AED prescriptions were observed and analyzed. In Rajindra Hospital, Patiala-AEDs were prescribed under RashtriyaBalSwasthyaKaryakram(RBSK) scheme. No variations were observed between prescribing practices of different doctors. All the pediatric patients coming to (all units of) Pediatric department were screened for epilepsy and then enrolled. Information of parental income was recorded and families were classified. Monotherapywas more commonly prescribedin lower class group 54% (52+2)as compared to polytherapy 28% (28+0) (table 5). But, in middle class group polytherapy 10% (10+0) was more frequently prescribed as compared to monotherapy 8% (6+2). The difference was statistically significant (p = 0.015) between middle and lower class group AED prescribing pattern.In current study socio-economic status of families was analyzed based on the parental income, parental education and parental occupation, and compared to AED prescription pattern. Association between household income of pediatric patients and AED prescriptions was observed and analyzed.

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Table-5. Prescription pattern of AED according to socio-economic status (SES) of study population

SES	Class	AED	Patients	Percentage	X^2	p value
26-29	Upper (I)	Monotherapy	0	0%	5.88	0.015 (S)
		Polytherapy	0	0%		
16-25	Upper Middle (II)	Monotherapy	1	2%		
		Polytherapy	0	0%		
11-15	Lower Middle (III)	Monotherapy	3	6%		
		Polytherapy	5	10%		
5-10	Upper Lower (IV)	Monotherapy	26	52%		
		Polytherapy	14	28%		
<5	Lower (V)	Monotherapy	1	2%		
		Polytherapy	0	0%		
		Total	50	100%		

DISCUSSION

The present study was conducted in pediatric patients with epilepsy of age group 1 to 17 years. The no. of boys were more than girls. According to another study by Chaitra K. M. et al. the incidence of epilepsy is more in males than females.[3]A prospective observational study by EswariP. V. S. N. et al. conducted in Andhra Pradesh, India found that male children were more prone to seizures than female children.[9] Another study was done by Idro et al. in Kenya found thehigher incidence of seizures in male children than female children.[10] So, the above data supports our study findings of higher case proportion of seizures in male children than female children.

In our study most commonly prescribed monotherapy was sodium valproate (38%) followed by levetiracetam (16%), and less commonly prescribed wascarbamazepine(2%), phenobarbitone(4%) and zolpidem(2%). Most commonly prescribed combination therapy (polytherapy) was sodium valproate with clobazam(22%). However, a study done by Mistry RA et al. in pediatric patients in Gujrat, India found that carbamazepine and sodium valproate were prescribed as primary anti-seizure drugs (ASD) in 96.98% patients. Also, second most common ASD was sodium valproate.[11]Another study,conducted

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in Jordan, by Albsoul-YounesA et al. in pediatric patients of epilepsysuggests that most frequently prescribed monotherapy was Valproic acid(50.5%) and carbamazepine(33.3%) and most common combination in dual therapy was valproic acid with carbamazepine(17.3%).[12]

In present study monotherapy (28%) was prescribed to a greater extent as compared to polytherapy(14%) in female children. But in male children, both monotherapy (28%) and polytherapy(30%) were used to similar extent. A study conducted in pediatric patients of epilepsy by Albsoul-Younes A et al. also found that gender has no effect on the probability of receiving monotherapy.[12] While age and whether educational or governmental hospital had a statistically significant effect on the likelihood of receiving monotherapy. The result of our study found no statistically significant difference in prescription pattern between female and male children. Also, suggested by other studies, prescription pattern depends on factors like age, hospital set-up rather than gender of the child.

Age and socio-economic status has a significant impact on the likelihood of receiving monotherapy. The highest incidence of epilepsy in childhood is during the first year of life, 0.2-0.6 per 1000 population in India.[13]A study in Sweden found that the spectrum of epilepsy disorders and the treatment in childhood, varies with age and there are age limitations in the licensing of different AEDs.[14] The main goal of the epilepsy therapy includes complete seizure control, no adverse drug effects and optimal quality of life.[12] The present study found thatyounger children (aged 1-6 years) had most commonly received monotherapy(20%) as compared to polytherapy(4%), and elder children (aged ≥6-17 years) received polytherapy (44%) to a greater extent than the younger children. Most commonly used AED was sodium valproate(38%) andlevetiracetam was less commonly prescribed in children(6%). According to a study by Malerba A et al. in Italy, valproic acid was most commonly used AED (46%) and levetiracetam was rarely used in children with epilepsy.[15]Another study by Mistry RA et al. observed that majority of pediatric patients with epilepsy (73.5%) were prescribed single ASD (monotherapy) while remaining children were on polytherapy. Most commonly usedmonotherapy was carbamezapine (50.9%) followed by sodium valproate in (46%) patients.[11] So, the observed results in our study and other studies suggest that overall monotherapy was more preferred in children as compared to polytherapy for better compliance, prevent side-effects, less drug-drug interactions. Also, the difference was statistically significant between age related prescribing pattern of children. But, unlike our study findings, one study observed the most commonly prescribed AED was carbamazepine followed by sodium valproate.According to another study conducted by Eswari P V S N et al., in India, most of the pediatric patients with seizure received mono therapy

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(77%) than dual therapy (23%). Monotherapy was preferred mostly since poly-therapy exposes the patients to unnecessary hazards like drug allergy, drug interactions, noncompliance, and economic burden.[9]

Socio-economic status of the family of the patients was calculated by using Modified Kuppuswamy's socio-economic status (SES) scale 2019.Monotherapy was prescribed more extensively to the children belonging to lower class than to the children belonging to middle class family. In middle class group, polytherapy was more commonly prescribed as compared to monotherapy. Polytherapy is associated with higher cost of medication, yet the only way of achieving improved seizure control in epilepsy patients, found in a study byVenkateswara Murthy N et al.[16]Our study indicates that the socio-demographic variables influence the access to hospital and individual AEDs for younger and elder children with epilepsy. The results of this study are important because they show that universal coverage to medical care has not yet eliminated inequalities of access to health care services. As we observed that prescription of AED differs according to socio-economic status of families, which is unfair in terms of heath care needs. Treatment given according to socio-economic status rather than health needs can result in unfavorable health outcomes.

The main strength of the study was it involved the different socio-economic classes of the society coming to the Pediatric department, Rajindra Hospital, Patiala. The main limitations of the study were, it was conducted with small study population and designed to limited duration of time. Children were not classified according to the type of epilepsy.

CONCLUSION

The present study concluded that AED prescription pattern varies according to socio-economic status, age and gender of the children. Monotherapy was frequently used ingirls and younger children (aged 1-6 years).Polytherapy was more frequently prescribed in elder children (age ≥6-17 years). Access to polytherapy was greater in children belonging to high income class family as compared to those belonging to low income class family. The mostcommonly prescribed AED as monotherapy was sodium valproate followed bylevetiracetamorcarbamazepine or zolpidem orphenobarbitone. Socio-demographic variables have a significant role in access to health care services. Inequality in terms of different anti-epileptic drug prescription in children with high household income vs children with low household income was seen.

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ABBREVIATIONS: AED – Anti-epileptic Drugs, SES Scale – Socio-economic Status Scale

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