

## RESEARCH ARTICLE

# Pediatric Neurology Patients: Parental Awareness of Adverse Effects of Long-term Corticosteroid Therapy

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## Abstract

**Background:** Corticosteroids are potent medications used to treat many inflammatory conditions in paediatric neurology practice. Although corticosteroids are beneficial, their adverse effects may be numerous and varied. As parents are the primary caregivers of paediatric patients, assessing their awareness is important.

**Methods:** To determine the parental awareness on the adverse effects of corticosteroid therapy in Paediatric Neurology Patients in the Neurology Unit at the Lady Ridgeway Hospital, Colombo, Sri Lanka, this descriptive cross-sectional study, looked at 300 parents of paediatric neurology patients on long-term corticosteroid therapy. Parents volunteered for the study and signed with informed consent. Ethical approval was obtained from the Ethics Review Committee of the same hospital. Data were collected using content validated, pre-tested self-administered questionnaire during January to March 2020.

**Results:** Of the total parents, the majority were mothers (87%, n=262) and more than 70% (n=211) of them completed their secondary education. Findings demonstrated that parents had average awareness about adverse effects of long-term steroid therapy including child's susceptibility to infections (69.0%, n=207), increase blood glucose levels (69.7%, n=209), moon face (60.3%, n=181), central obesity (60.3%, n=181), increase blood pressure levels (58.0%, n=174) and (irritability 50.3%, n=151) while poor awareness on adverse effects include buffalo humps (26.7%, n=80) increase fracture tendency (24.3%, n=73), tarry colour stools (24.3%, n=73), vision impairment (24.0%, n=72), glaucoma (17.3%, n=52), cataract (16.0%, n=48) and delayed wound healing (23.0%, n=69). According to the findings, overall mean (SD) knowledge percentage on parental awareness of adverse effects was found to be low ( $38.24 \pm 20.57$ ).

**Conclusion:** Since parental awareness of the adverse effects of long-term corticosteroid therapy is inconsistent, special attention is needed to plan and implement appropriate awareness sessions.

**Keywords:** Paediatric neurology patients, corticosteroid therapy, parental awareness, adverse effects

## Background

Paediatric neurology or child neurology refers to a special branch of medicine that deals with the management of neurology condition in neonates, infants, children, and adolescents. The discipline of paediatric neurology encompasses diseases and disorders of the brain, spinal cord, peripheral nervous system, autonomic system, muscle and blood vessels that affects individual in this age group.

Over the past two decades, high-dose of corticosteroids therapy (an approach already used to treat several neurological syndromes such as multiple sclerosis) has been used in various studies in the field of epilepsy in order to avoid the development of adverse effects and maintained long term efficacy (Aykut-Bingol et al., 1996; Annane et al., 2019; Aljebab et al., 2017; Smit et al., 2017). In the USA in 2019

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alone, corticosteroids were the most common specific cause for drug-related adverse effects, accounting for 10.3% of all drugs related adverse effects and 141,000 hospital stays (Annane et al., 2019).

Most of the neurological conditions among children are more common in clinical practice and are chronic and frustrating to parents. Recent evidence shows that corticosteroids, which are synthetic drugs that closely resemble cortisol, a hormone that our body produce naturally, (Prednisolone, Methylprednisolone and Adrenocorticotrophin) have been used extensively to treat many of these neurological conditions (auto immune diseases, epilepsy) due to their anti-inflammatory and structural effects. Furthermore, global literature reveals a major concern related corticosteroid, especially in children and adolescents: the possible development of adverse effects. The most frequent ones are excessive weight gain, hyperphagia, water retention with oedema, cushingoid appearance, hypertension, behavioural disturbances, increased infection susceptibility, electrolyte disturbances, hyperglycaemia, glycosuria, impaired glucose tolerance, frank diabetes, and sleep disorders. Furthermore, long term adverse effects such as hypothalamus-pituitary axis suppression, psychosis, osteoporosis, nephrocalcinosis, brain atrophy, cataracts and, in children growth retardation, have also been reported (Hu & Xie, 2019; Kusljic et al., 2016; Milyani & Al-Agha, 2018; Doody & Bailey, 2016).

Although corticosteroids are medications beneficial in pediatric neurology practice, prolonged use (more than six month) of high doses of corticosteroids are associated with number of adverse effects, particularly in the immune, musculoskeletal systems, including ocular, dermatological, central nervous, endocrine, cardiovascular and gastrointestinal system. According to the study done in Italy on topical steroids (TCS), it reveals that topical corticosteroids (TCS) phobia is widespread among Italian families of children with Atopic dermatitis. Fear of TCS is associated with fear of applying too much cream, thus increasing the risk of poor compliance and treatment failure. This study highlighted that therapeutic education of the parents should be implemented, since lack of parental awareness of adverse effects and their preventive measures may significantly attribute to limited success of preventing adverse effects of long-term corticosteroid therapy among paediatric neurology population and also may lead to discontinuation of therapy.

Corticosteroids usage prevalence in paediatric neurology population in neurology unit Lady Ridgeway Hospital (LRH)

has increased significantly due to their therapeutic effect on some neurological conditions. This situation emphasizes the growing need of prevention of adverse effects of this potent medications without being disadvantageous to the treatment. Parental awareness plays a major role in identifying and prevention of such adverse events. Therefore, this study aims to explore parental awareness of adverse effects and prevention of long-term corticosteroid therapy among paediatric neurology patients in neurology unit at LRH.

## Methods

### Study design

This was a quantitative descriptive cross-sectional study conducted at the Lady Ridgeway Hospital for Children (LRH), Colombo, Sri Lanka. The tertiary care hospital is considered as the largest children's hospital in the world with a bed-strength of over 900. The study was conducted among parents attending the neurology unit with their children for long-term steroid therapy from the 5<sup>th</sup> January and 31<sup>st</sup> March 2019. Purposive heterogeneous sampling technique had been used in this study to obtain a representative sample by using a judgment, which will result in saving time and money.

### Sample size determination and sampling procedures

Three hundred parents (father or mother) of children with neurological diagnosis and receiving corticosteroids in long term basis in neurology unit at LRH were purposively recruited for this cross-sectional study. Parents with children age less than 14 years diagnosed for neurological disorder and on corticosteroids for long-term basis at the neurology unit were recruited for this study.

### Study instrument and Data collection

Data was collected using structured questionnaire, which was developed after reviewing literature and by obtaining inputs from clinical medical experts. It consisted of three sections and only the second section (secondary data from clinic books) was filled by investigators and the rest was filled by parents. The first section was filled with socio-demographic information of the parents. The second section comprised of eight parts with 23 questions focused on assessment of parental awareness of corticosteroid adverse effects. Third section included 18 items to assess parental awareness of preventive measures of cortico-steroid adverse effects. The questionnaire was initially developed in English and then translated into Tamil, and it was administered considering

parents' preferred medium. Content validity of the questionnaire was ensured by clinical and research experts. Questionnaire was pre-tested among 10 parents who were not involved in the study and finalized after incorporating comments received during the pre-test. Data were collected during 5<sup>th</sup> January and 31<sup>st</sup> March 2019. In general, 15-20 questionnaires were filled during a day without disturbing parents in their routines at the clinic. Clarifications were done through continuous follow up and supervision by the supervisors and principal investigators occurred throughout the data collection period.

### Limitation of data collection

There were some limitations of data collection, such as children were not given specific diagnosis for their disease, parents with aggressive children who could not fill the questionnaire, some children accompanied by their guardians, faraway parent refusing to fill questionnaire because of concerns about time and more children undergoing short term corticosteroid therapy. In addition, researchers expected participation of equal number of both parents. Unfortunately, this did not occur during data collection period. Fathers' participation is noticeably lesser when compared with mothers' participation.

### Ethical consideration

Ethical clearance was obtained from Ethics Review Committee of the Lady Ridgeway Children Hospital, Sri Lanka, with the permission to conduct the research at neurology unit. When the inclusion criteria were met, participants were given the information letter, which was in Sinhala, Tamil and English. Written consent was taken prior to the study from the participants who was willing to accept. Privacy and confidentiality were preserved throughout the study. Personal details were not mentioned. A code was provided for each record. Data collection was done without hindering the participants' day-to-day activities. There were no risks for the individual subject.

### Data analysis

After collecting data from the subject, the investigators prepared the data for analysis. In this study, the data was prepared using softwares such as Microsoft excel and Statistical Package for the Social Science (SPSS) version 18 (Frey, 2017).

## Results

In this study, the questionnaire had 65 questions with some data views and variable views. The researchers included the following marks to denote the answers on the questionnaire: Yes-1 mark, No-0 mark, Don't know-0 mark. No and Don't Know answers were considered one and the same.

Table 1. Distribution of demographic data

Characteristic	Frequency (%)
<b>Parent</b>	
Male	
Female	262(87.3)
<b>Age (in years)</b>	
<18	8(2.7)
18-30	41(13.7)
31-40	165(55.0)
41-50	71(23.7)
51-60	15(5.0)
<b>Marital Status</b>	
Married	295(98.3)
Single	1(0.3)
Divorced	3(0.7)
Widowed	2(0.7)
<b>No of Children</b>	
One	75(25.0)
Two	138(46.0)
Three	79(26.3)
Four	6(2.0)
Five	2(0.7)
<b>Ethnicity</b>	
Sinhalese	267(89.0)
Tamil	8(2.7)
Muslim	21(7.0)
Other	4(1.3)
<b>Education Level</b>	
Not school attend	1(0.3)
Completed primary	10(3.3)
Grade 6-11	46(15.3)
Ordinary Level	117(39.0)
Secondary Level	94(31.3)
Professional Course	17(5.7)
Degree	15(5.0)
<b>Employment</b>	
Government	29(9.7)
Private	21(7.0)
Business	18(6.0)
Labor	9(3.0)
Other	9(3.0)
Non employed	214(71.3)
<b>Monthly income (SLR)</b>	
<12,000	20(6.7)
12,000-20,000	56(18.7)
20,001-30,000	84(28.0)
>30,000	140(46.7)

Then the marks were converted into percentage.

The results were reported in terms of describing characteristics of the study sample. When finding socio-demographics characteristics in the study sample, it was discovered that mothers accompanied their children most (87.3%). And that most of them were in between 31-40 years (55.0%) of age while those who have other children numbered around 46.0%. According to the ethnic distribution of the sample, 89.0% were Sinhalese. Participating percentage of working parents were 28.7% (Table 1).

**Association between socio-demographic characteristics and parental awareness of adverse effects of corticosteroid therapy**

Association between social-demographics characteristics and parental awareness of adverse effects of corticosteroids were shown in Table 2. Accordingly, there were statistically significant association between number of children in a family ( $p = 0.049$ ) and ethnicity ( $p = 0.000$ ) with the parental awareness of the adverse effects of corticosteroids. However, there was no significance association between parental awareness of the adverse effects of corticosteroids and category of parent, parent's age, educational level, employment status and monthly income.

**Parental awareness of corticosteroid adverse effects**

This part of the questionnaire consisted of eight parts with 23 questions. The findings show that parents have more

experience and awareness about the adverse effect of increased hunger 73.3% ( $n = 220$ ), child's susceptibility to infections 69.0% ( $n = 207$ ), increased blood glucose levels 69.7% ( $n = 209$ ), moon like face 60.3% ( $n = 181$ ), central obesity 60.3% ( $n = 181$ ), increased blood pressure levels 58.0% ( $n = 174$ ), and irritability 50.3% ( $n = 151$ ) during long term corticosteroid treatment. Parent awareness about buffalo humps 26.7% ( $n = 80$ ), increased fracture tendency 24.3% ( $n = 73$ ), tarry colour stools 24.3% ( $n = 73$ ), vision impairment 24.0% ( $n = 72$ ) and delayed wound healing 23.0% ( $n = 69$ ). Parental awareness about adverse effects like acne 19.7% ( $n = 59$ ), glaucoma 17.3% ( $n = 52$ ) and cataract 16.0% ( $n = 48$ ). Findings are shown in Table 3 and Figure 1.

Figure 1. Parental awareness of adverse effects in different categories.

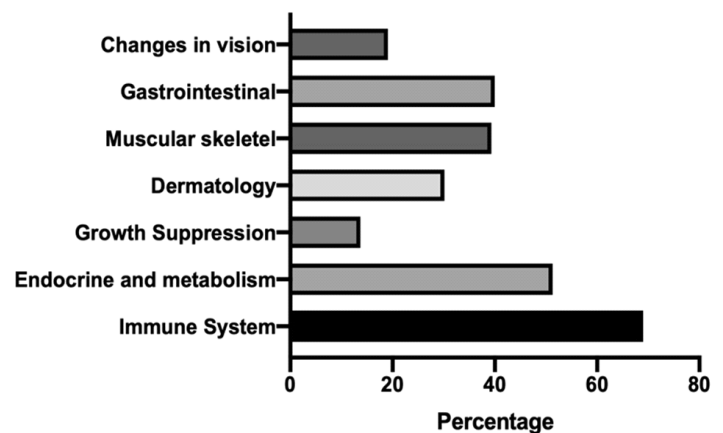


Table 2. Socio-demographic characteristics with parental awareness about adverse effects of long-term corticosteroid therapy.

Characteristic	Category	Awareness		p value
		Poor n(%)	Good n(%)	
Parents	Father	28(12.9)	10(12)	0.842
	Mother	189(87.1)	73(88)	
Age	<= 40 years	160(73.7)	54(65.1)	0.137
	>40 years	57(26.3)	29(34.9)	
No of Children	<= 2 children	161(74.2)	52(62.7)	0.049
	>2 children	56(25.8)	31(37.3)	
Ethnicity	Sinhalese	185(85.3)	82(98.7)	0.000*
	Others	32(14.7)	1(1.2)	
Education	Up to (O/L)	130(59.9)	44(53)	0.279
	Above (A/L)	87(40.1)	39(47)	
Employment	Yes	57(26.3)	29(34.9)	0.137
	No	160(73.7)	54(65.1)	
Income(Monthly)	<=SLR 30,000	119(54.8)	41(49.4)	0.398
	>SLR 30,000	98(45.2)	42(50.6)	

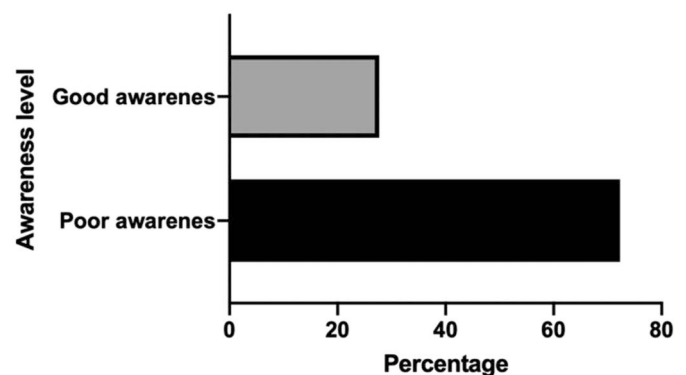
\* p-value obtained from Fishers exact test Significance -  $p < 0.05$ ; (p-value = Pearson chi-square value).

Table 3. Parental awareness regarding steroid adverse effects.

Category	Correct n (%)	Incorrect n (%)	Awareness level % of categories
<b>Immune System</b>			
Steroid increase child's susceptibility to infection	207(69.0)	93(31.0)	69.0
<b>Endocrine and metabolism</b>			
Developing cushioned sign	181(60.3)	80 (26.7)	51.3
Moon face's	119 (39.7)	220 (73.4)	
Buffalos hump central obesity	181 (60.3)	119(39.7)	
Increase blood glucose level	209 (69.7)	91 (30.4)	
Increase blood cholesterol level	99 (33.0)	201(67.0)	
Increase blood pressure	174 (58.0)	126(42.0)	
<b>Growth Suppression</b>			
Inhibit inner growth	4 (13.7)	259 (86.4)	13.7
<b>Dermatological side effects</b>			
Mild to moderate hair growth	117 (39.0)	183(61.0)	30.14
Facial redness	99 (33.0)	201(67.0)	
Sweating	108 (36.0)	192 (64.0)	
Acne	59 (19.7)	241 (80.3)	
Delayed wound healing	69 (23.0)	231 (77.0)	
<b>Musculoskeletal</b>			
Increase tendency of fracture	73 (24.3)	227(75.6)	24.3
<b>Behavioural changers</b>			
Lack of sleep	102 (34.0)	198 (66.0)	44.3
Mood changers	146 (48.7)	154(51.3)	
Irritability	151 (50.3)	149 (49.6)	
<b>Gastrointestinal</b>			
Increase hunger	220 (73.3)	80 (26.7)	39.98
Continues crying	108 (36.0)	192 (64.0)	
Nausea	106 (35.3)	194 (64.7)	
Vomiting	93 (31.0)	207 (69.0)	
Tarry colour stool	73 (24.3)	127 (75.6)	
<b>Changes in vision</b>			
Vision impairment	72 (24.0)	228 (76.0)	19.1
Cataract	48 (16.0)	252(84.0)	
Glaucoma (Eye pressure)	52 (17.3)	248 (82.7)	

According to the findings, overall mean (SD) knowledge percentage on parental awareness of adverse effects was found to be lower ( $38.24 \pm 20.57$ ) and cannot be accepted as adequate. However, for the purpose of the study, knowledge on parental awareness on adverse effects on corticosteroid was categorized as good ( $\geq 50$ ) versus poor ( $<50$ ). Accordingly, 72.3% (n=217) parents had poor knowledge and it was shown in Figure 2.

Figure 2. Parent's awareness about adverse effects



### Parental awareness in preventive measures of corticosteroids' adverse effects

Questionnaire consisted of questions under eight categories with 18 questions to measure parental awareness of preventive measures of corticosteroids' adverse effects (n=300) and findings are showed in Table 4 and Figure 3. According to the findings, the most of parents have knowledge to keep child

away from crowded places (70.0%, n=217), and to take immediate medical advice if the child becomes in contact to chickenpox virus 67.0% (n=201). Higher proportion of parents knew the need of immediate medical assistance if the child is suffering from fever, cough vomiting and diarrhoea (>86%) However, parental awareness on preventive measures for fractures is very low (29.3%, n=88).

Table 4. Parental awareness of preventive measures of cortico-steroid adverse effects

Category	Correct n (%)	Incorrect n (%)	Preventive awareness %
<b>Immune System</b>			
Prevent exposure to chickenpox	210 (70.0)	90 (30.0)	78.75
If contact to chickenpox get medical advice	201 (67.0)	99 (33.0)	
Need immediate medical care			
Fever	273 (91.0)	27 (9.0)	
Vomiting	263 (87.7)	37(12.3)	
Cough	259 (86.3)	41 (13.7)	
Diarrhoea	264 (88.0)	36(12.0)	
Not exposure to crowd	229 (76.3)	71(23.6)	
Should wear a mask	191 (63.7)	109 (31.3)	
<b>Endocrine and metabolic adverse effects</b>			
Monitor fasting blood sugar	160 (53.3)	140 (46.7)	63.52
Monitor serum electrolytes	121 (40.3)	179(59.7)	
Monitor child's weight	149 (49.7)	151 (50.4)	
Diet consist plenty of vegetables and fruits	245 (81.7)	55(18.3)	
Diet should less			
Starchy food	218 (72.7)	82 (27.3)	
Oily food	209 (69.7)	91 (30.3)	
Sugar	232 (77.2)	68 (22.7)	
<b>Growth retardation</b>			
Monitoring height	155 (51.7)	145(48.4)	51.7
<b>Dermatological adverse effects</b>			
Skin changers disappear with withdraw of steroids	105 (35.0)	195 (65.0)	30.14
<b>Muscular skeletal adverse effects Medical advice to prevent fractures</b>			
Essential to give calcium	138 (46.0)	159 (54.0).	37.66
Essential to give vitamin D	88 (29.3)	212 (70.7)	
<b>Fluid and electrolytes</b>			
Blood pressure monitor 14 days is essential	157 (52.3)	143 (58.6)	51.66
Diet should consist with low salt	153 (51.0)	147 (49.0)	
<b>Gastrointestinal adverse effects</b>			
Give steroid 1/2 hour after administer antacid	110 (36.7)	190 (63.3)	45.16
Seek medical advice when tarry stool is present	161 (53.7)	144(46.3)	
<b>Prevention of adverse effects to eye</b>			
Medical advice to check cataract and glaucoma	163 (54.3)	137 (45.6)	54.33

Figure 3. Parental awareness of preventive measures of adverse effects of corticosteroids in different categories

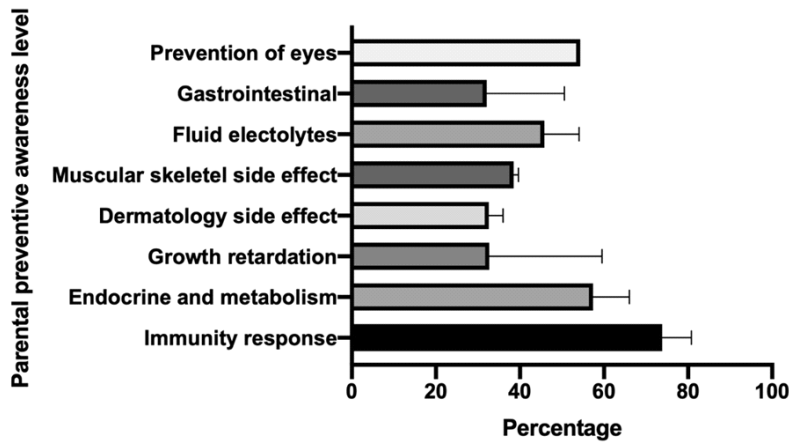
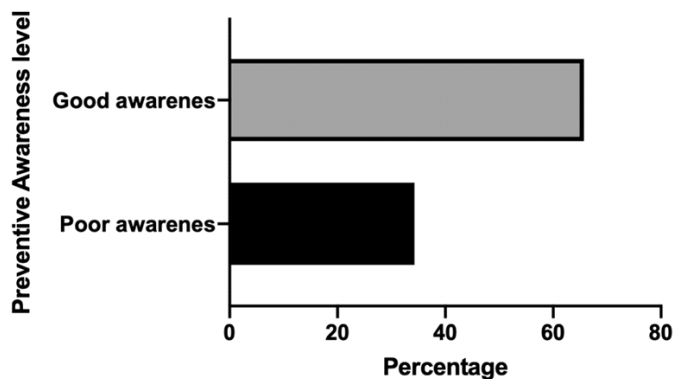


Figure 4. Parental overall awareness of preventive measures of adverse effects of corticosteroids



According to the findings, overall mean (SD) percentage on parental awareness of preventive measures of adverse effects of corticosteroids was  $61.86 \pm 22.52$ . For the purpose of the study, it was categorized as good ( $\geq 50$ ) versus poor ( $< 50$ ) considering the mean value. Accordingly, 65.7% ( $n=197$ ) of parents' awareness of preventive measures was good (Figure 4).

#### Association between socio-demographic characteristics and parental awareness of preventive measures of adverse effects of corticosteroids

As shown in Table 5, there were significant associations between parental awareness of prevention of adverse effects of corticosteroids and their monthly income ( $p = 0.001$ ) and adequacy of the income ( $p = 0.027$ ).

## Discussion

Corticosteroids have been the mainstay of management for more than a half-century (Ayyar & Jusko, 2020). Findings of this study show that parental awareness of corticosteroid adverse effects and preventive measure influence the continuation of their treatment of their children.

Table 5. Association between socio-demographic characteristics and parental awareness of preventive measures of adverse effects of corticosteroids

Characteristic	Category	Awareness		p value
		Good n (%)	Poor n (%)	
Parents	Father	26(13.2)	12(11.7)	0.702
	Mother	171(86.8)	91(88.3)	
Age	$\leq 40$ years	139(70.6)	75(72.8)	0.681
	$>40$ years	58(29.4)	28(27.2)	
No of Children	$\leq 2$ children	135(68.5)	78(75.7)	0.192
	$>2$ children	62(31.5)	25(24.3)	
Ethnicity	Sinhalese	174(88.3)	93(90.3)	0.605
	Others	23(11.7)	10(9.7)	
Education	Up to (O/L)	108(54.8)	66(64.1)	0.123
	Above (A/L)	89(48.2)	37(35.9)	
Employment	Yes	89(29.9)	27(26.2)	0.497
	No	138(70.1)	76(73.8)	
Income (Monthly)	$\leq$ SLR 30,000	91(46.2)	69(67.0)	0.001
	$>$ SLR 30,000	106(53.8)	34(33.0)	

(p-value = Pearson chi-square value).

Many studies have illustrated how patient attitude and knowledge affects the continuation of their children steroid therapy and this may reduce implication of hospital stay thus leading to economic benefit (Maharaj et al., 2000).

In this study it was shown that the majority of participants have poor awareness on adverse effects of long term corticosteroid therapy. Sample of 217 participants out of sample population of 300 demonstrated poor awareness of adverse effects of corticosteroids. Since the male and female participants sample were not comparable with the awareness of mothers versus fathers. These results were in contrast with another study that was done in Netherland. The findings of that study have shown that parents' awareness of adverse effect was good (Hendriksen et al., 2017). A similar situation, in Arab Emirates, Al Lela et al., (2014) pointed out parents' awareness showed that associated risks was poor. Most probable reason for this contrast (Al-Lela et al., 2014) is that Netherlands is a developed country, and they use new technology and educational method than Sri Lanka.

In this present research, there were statistically significant association of number of children in a family ( $p=0.049$ ) with the parental awareness of the adverse effects of corticosteroid. The parents who have less than two children had poor awareness about adverse effects of corticosteroid than the parents who have more than two children ( $p<0.05$ ). There were statistically significant association of ethnicity ( $p=0.000$ ) with the parental awareness of the adverse effects of corticosteroid. However, majority of people had less awareness regarding the adverse effects of corticosteroid ( $p<0.05$ ). There was no significant association between educational level ( $p=0.279$ ), occupational participation ( $p=0.137$ ), monthly income ( $p=0.398$ ), the sufficiency of income level, age, height and clinical diagnosis for parental awareness of the adverse effects of corticosteroids, because their  $p$  value was high ( $p>0.05$ ).

According to the present study, a significant proportion of participants had a better awareness of adverse effects of increase hunger 73.3% ( $n=220$ ), susceptibility to infection 69% ( $n=207$ ), increased blood glucose level 69.7% ( $n=209$ ), moon like face 60.3% ( $n=181$ ), central obesity 60.3% ( $n=181$ ), increase blood pressure level 58% ( $n=174$ ) and irritability 50.3% ( $n=151$ ). In contrast the awareness of long-term steroid therapy such as buffalo humps 26.7% ( $n=80$ ), Increased fracture tendency 24.3% ( $n=73$ ), tarry colour stools 24.3% ( $n=73$ ), vision impairment 24% ( $n=72$ ) and delayed wound healing 23% ( $n=69$ ) during long term corticosteroid

treatment was poor. The better awareness on the adverse effects like increased hunger, moon like face attributed to the parents' personal experience with their own children who were on long term corticosteroid therapy. Findings of present study revealed that parents were more awareness regarding the side effect of increased hunger 73.3% ( $n=220$ ) than the others. There was a similar situation found in Netherlands. According to them, the most frequent was change in taste (61%), facial flushing (61%), feeling sick or having stomach pain and disturbance (44%) (Chalitsios et al., 2020).

According to the findings of study, socio demographic data, monthly income ( $p=0.001$ ) and adequacy of the income ( $p=0.027$ ) were statistically significant and associated with preventive measures of adverse effects of corticosteroids. The preventive measure for adverse effects of corticosteroid was also related to family's income. Those who have more income ( $>Rs30000$ ) had taken many preventive methods than the families with low income. Parents ( $p=0.702$ ), age ( $p=0.192$ ), number of children ( $p=0.605$ ), ethnicity ( $p=0.605$ ), education level ( $p=0.123$ ) and employment ( $p=0.497$ ) were not statistically significant in association with the preventive measures about adverse effects of corticosteroids. In this study it was noticed that majority of parents know that the child should be kept away from crowded places 70% ( $n=210$ ), if contact to chickenpox virus need immediate medical advice 67% ( $n=201$ ). They also had vomiting 87.7% ( $n=263$ ), diarrhoea 88% ( $n=264$ ), cough 86.3% ( $n=259$ ). It may be that the parents are scared of chickenpox due to their past experience with it. So, they are very concerned about taking preventing measure from chicken pox. This may be a reason for the above result.

In the present study, researchers identified that they have less awareness about vitamin D supplement that should be given to prevent fracture (29.3%). These results were in contrast with another study done in England. Chalitsios et al., (2020) pointed out that meta-analysis demonstrates a clinically statistically significant prevention of bone loss at lumbar spine and forearm with vitamin D and calcium in corticosteroid treatment (Chalitsios et al., 2020). In UK, this study done about oral corticosteroid treatment is for the prevention of osteoporosis. The study highlighted that there is a large number of people who are taking continuous oral steroids and shows the preventive measures for osteoporosis are being implemented frequently.

Findings of the present study highlighted preventive measure knowledge percentage of parental awareness of adverse



effects was higher and can be accepted as adequate since they have good preventive awareness. Result of parental preventive awareness was good 65.7% (n=197). These results were in contrasts with another study done in Morocco, about long term glucocorticoids steroid hormone therapy. According to the study, weight gain (27%) out of (18%) patient reported episodes of treatment discontinuation (Nassar et al., 2014). It may be reason for poor knowledge about preventive measure of adverse effects of steroid therapy in Morocco.

### Conclusion

In most neurological condition among children requiring treatment with corticosteroids in long term basis, this required mode of therapy cannot be replaced by any other. Usually, long term treatment with corticosteroids benefits outweigh the adverse effects, with time. However, complication of therapy may become a burden for the children. In most cases, they are unable to give up long-term corticosteroid treatment, and for that reason it is not possible to avoid the adverse effects. However, with increasing parental awareness of corticosteroid adverse effects and proper prevention methods, they can be minimized or prevented. According to the findings of study conducted in LRH Neurology Unit, overall parental awareness of adverse effects is poor and preventive awareness of adverse effects of long-term corticosteroid therapy are good. Therefore, special attention is needed to increase parental awareness of adverse effects of long-term corticosteroid therapy.

### Abbreviations

TCS- topical steroids/topical corticosteroids; LRH-Lady Ridgeway Hospital; SPSS-Statistical Package for the Social Science

### Ethics approval and consent to participate

Signed informed consent was obtained from all participants' parents or legal guardians. Ethical clearance was obtained from Ethics Review Committee of the Lady Ridgeway Children Hospital, Sri Lanka, with the permission to conduct the research at neurology unit.

### Consent for publication

Not applicable.

### Availability of data and material

The datasets used during the current study are available through the corresponding author on reasonable request and upon permission from the university and the hospital.

### Competing interests

The authors declare that they have no competing interests.

### Funding

No external funding was provided. The work was conducted by authors as part of their regular duties or on a volunteer basis.

### Authors' contributions

PerUKC: Collected the data, PerUKC and SamJSEA: performed data analysis, PerUKC, ShiHWCK and MohWMD: interpreted the data, and wrote the manuscript. SriKA and FaiMMTM: Designed the study, involved in critical revision of the manuscript. All authors read and approved the final version of the manuscript.

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### Acknowledgment

We would like to express our gratitude to Consultant Paediatrics Neurologists, Dr. Pyara Rathnayake and Dr. Anuruddha Padeniya at Lady Ridgeway Children Hospital, Colombo Sri Lanka for their valuable guidance and support extended us during the research.

