

# Appropriateness of Hospital Admission and Length of Stay in the Pediatric Department of a Tertiary Care Hospital in West Bengal

Sampriti Samanta, Alapan Bandyopadhyay, Abhijit Mukherjee<sup>1</sup>, Sharmistha Bhattacharjee

Department of Community Medicine, North Bengal Medical College, Darjeeling, West Bengal, <sup>1</sup>Department of Community Medicine, Nil Ratan Sircar Medical College, Kolkata, West Bengal, India

## Abstract

**Background:** Appropriateness of admissions and inpatient length of stay (LOS) are important factors controlling health-care expenditure. The current study was conducted to assess the proportion of appropriate admissions among 29-day to 12-year-old aged patients admitted to pediatric wards of a tertiary health-care center in one month and evaluate inappropriate LOS among them. **Materials and Methods:** An observational longitudinal study was carried out for two months among patients admitted to the pediatric inpatient department using Pediatric Appropriateness Evaluation Protocol (PAEP)-II tool. All patients admitted to the institution during the study period were included in the study. **Results:** Among 495 children, 438 (88.5%) were appropriately admitted. Inappropriate admission was mostly found in children aged 1 to 5 years (29, 16.6%), those who lived >5 km from the hospital (45, 15.2%), and those who presented with other systemic illnesses (13, 31.7%). Among the appropriately admitted children, 333 (76%) met the criteria of appropriate LOS during their hospital stays. Multivariable logistic regression showed that the age of the children (AOR = 0.99; 95% CI = 0.98, 0.99), age-appropriate feeding (AOR = 2.12; 95% CI = 1.30, 3.47), and hematological disorder (AOR = 0.16; 95% CI = 0.05, 0.52) were found to be associated with the children being kept at the hospital inappropriately. **Conclusions:** The current study observed a high proportion of appropriate admission in children. However, a higher proportion of inappropriate LOS among them was seen. The younger age group, age-appropriate feeding, and type of illness were found as the primary predictors for inappropriate LOS.

**Keywords:** Admission, hospital, length of stay

## INTRODUCTION

Evaluation of the admissions and patients' length of stay (LOS) is important in hospital management to ease the burden on the health-care system and increase its operational efficiency. Inappropriate hospital admission leads to significant depletion of hospital resources and is a burning problem in developing countries across the world.<sup>[1-3]</sup> Inappropriate admissions also increase the chances of contracting nosocomial infections, especially in tertiary care hospitals dealing with the most critically ill patients. Because of the high expense of health-care services in Western countries, there is a greater emphasis on the appropriateness of hospital services utilization. A study that evaluated the effect of inappropriate hospitalization in three countries through propensity score matching reported that the inappropriate group had excessive health service utilization compared with appropriate admissions, especially for internal diseases.<sup>[1]</sup> A cross-sectional study in Spain found

that standardizing admission and discharge process can improve utilization, patient flow and waiting time.<sup>[4]</sup>

The three-tier public health-care system of India accounts for more than 40% of total inpatient health-care delivery to its 1.38 billion population.<sup>[5]</sup> However, with a hospital bed to population ratio of only 5.3 per 10,000, it is also one of the most overburdened health-care systems in the world.<sup>[6]</sup> Pediatric disease management is among the most resource-intensive disciplines of medicine, and children are most prone to suffer

**Address for correspondence:** Dr. Sharmistha Bhattacharjee, Department of Community Medicine, North Bengal Medical College, Darjeeling-734 012, West Bengal, India. E-mail: sharmistha.bhattacharjee@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Samanta S, Bandyopadhyay A, Mukherjee A, Bhattacharjee S. Appropriateness of hospital admission and length of stay in the pediatric department of a tertiary care hospital in West Bengal. Indian J Community Med 2023;48:841-5.

**Received:** 06-01-22, **Accepted:** 15-09-23, **Published:** 01-12-23

### Access this article online

Quick Response Code:



Website:  
www.ijcm.org.in

DOI:  
10.4103/ijcm.ijcm\_20\_22

from the ill effects of inappropriate admissions. A possible way of avoiding this is by using a standardized protocol for admission and hospital stays. In the absence of information on the same, the present study was conducted to assess the appropriateness of admissions and LOS of pediatric patients in a tertiary care teaching hospital in Eastern India.

**MATERIALS AND METHOD**

**Study design, study period, and setting**

This observational, longitudinal study was conducted in the pediatric ward of North Bengal Medical College and Hospital, a tertiary care teaching hospital from 01.11.2019 till 31.12.2019 (including the follow-up period of last recruited participant).

**Study population**

Children aged 29 days to 12 years admitted to the pediatric wards from the emergency or outpatient department were included in the study. Children with non-consenting parents were excluded.

**Sampling**

During the period of study, a total of 504 children were admitted. After getting consent from their parents, 495 children were included.

**Study tools**

PAEP-II tool was used to collect data. It is a widely used validated tool to assess the appropriateness of hospital admissions and has been validated for the Indian health-care scenario.<sup>[7]</sup> The PAEP-India tool is available in two versions, one for neonates ( $\leq 28$  days) and another for children ( $> 28$  days to 18 years). In this study PAEP-II for

children was used. Section I assesses the appropriateness of admission with the following criteria:

- Severity of illness: 9 criteria
- Severe electrolyte/acid-base/CBC abnormality: 15 criteria
- Conditions not responding to out-patient management: 8 criteria
- Special pediatric problems: 5 criteria
- Intensity of services: 7 criteria

Section II assesses the length of hospital stay with the following criteria:

- Medical services: 9 criteria
- Nursing/life support services: 9 criteria
- Patient condition within 24 hours: 5 criteria
- Patient condition within 48 hours: 6 criteria

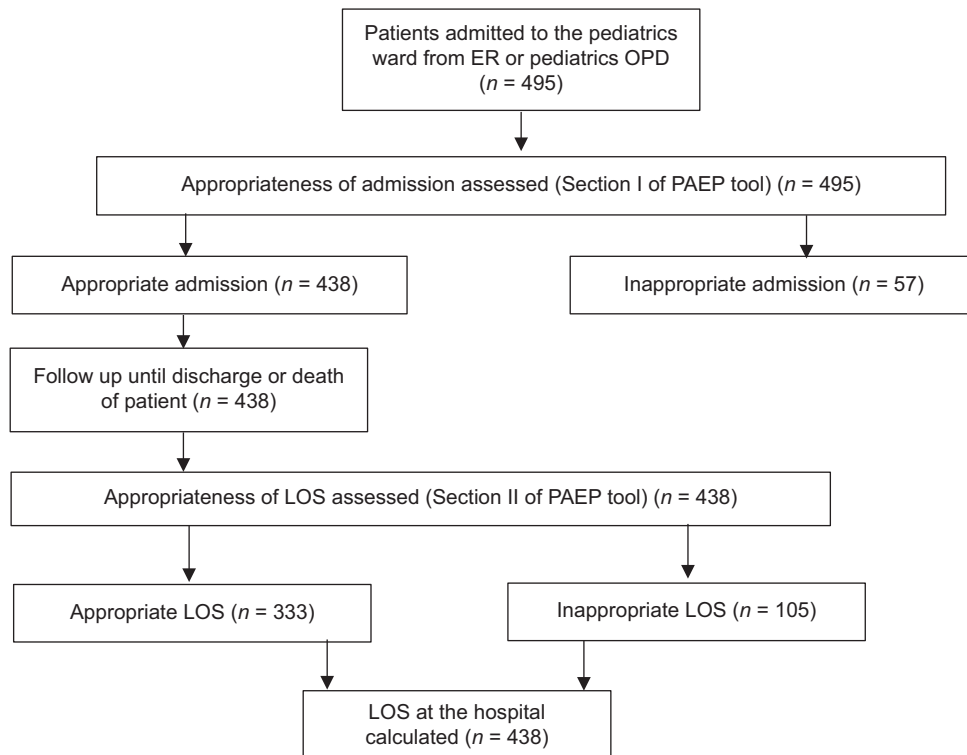
An admission was considered to be appropriate if any one of the criteria for section I was met. Similarly, meeting any one of the criteria for Section II represented that the LOS at the hospital was appropriate for the patient.

**Data collection**

Patients were assessed for appropriateness of admission at the time of their admission to the pediatric ward. Only those found to be admitted appropriately were followed up till their discharge or in the event of their death. The LOS in the hospital, were assessed as being appropriate or inappropriate using the PAEP tool. If a patient admitted for less than 24 hours then LOS was counted as ‘0’ days. The data collection procedure is shown in Figure 1.

**Data analysis**

Collected data were entered into and cleaned using MS



**Figure 1:** Flowchart of the data collection procedure for the study

Excel (Microsoft Corp) and analyzed using the IBM Statistical Package for Social Sciences (SPSS v. 22). Sociodemographic and admission-related characteristics were presented as frequencies and percentages. For assessing the association between different patient characteristics and appropriateness of their LOS, a multiple logistic regression analysis was used. Bivariate logistic regression was performed and predictors with  $\leq 0.10$  level of significance were considered for backward stepwise multivariable logistic regression. A *p* value of  $< 0.05$  was considered to be statistically significant.

**Ethical consideration**

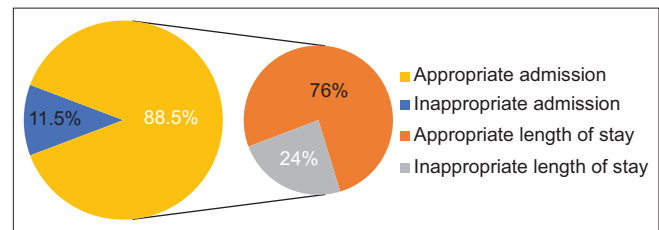
The present study was granted clearance by the Institutional Ethics Committee [NBMC/IEC/2019-20/116]. Written informed consent was obtained from the parents and/or guardians of the patients, and care was taken to ensure confidentiality and anonymity.

**RESULTS**

Of the total 504 children admitted to the pediatric ward during the study period, the parents of 9 children did not provide consent and were excluded (1.7% non-response rate). Most of the patients were less than 1 year of age (35.8%), with a median age of 24 months. Sixty percent of the admitted patients were

male and were from families that lived more than 5 km away from the hospital. Of the children, 89.5% had age-appropriate immunization, and 67.1% had age-appropriate feeding. Of the admissions, 41.2% were for respiratory diseases, followed by 23.6% for hematological diseases [Table 1]. Among admitted children, 6 (1.9%) deaths were reported, while the others were discharged in stable condition.

Analysis of appropriateness of admission found that among the 495 participants, 57 (11.5%) were admitted inappropriately [Figure 2]. Inappropriate admission was more prevalent among children aged 1 to 5 years (16.6%), those who lived  $> 5$  km from the hospital (15.2%), and those (31.7%) who presented with other systemic illnesses (fever under evaluation, joint pain, diabetes) [Table 2].



**Figure 2:** Appropriate admission and length of stay of patients in pediatric wards (*n* = 495)

**Table 1: Distribution of study population according to sociodemographic and other characteristics (*n*=495)**

Variables	Frequency	Percentage (%)
Age group (in year)	<1	177 (35.8)
	1–5	175 (35.4)
	6–10	124 (25.1)
	>10 (up to 12)	19 (3.7)
Sex	Male	297 (60)
	Female	198 (40)
Religion	Hindu	317 (64.0)
	Muslim	153 (30.9)
	Others	25 (5.1)
Distance of residence from hospital	$\leq 5$ km	208 (42.0)
	$> 5$ km	287 (58.0)
Age-appropriate immunization	Yes	443 (89.5)
	No	52 (10.5)
Age-appropriate feeding	Yes	332 (67.1)
	No	163 (32.9)
Diagnosis	Cardiological	7 (1.4)
	Gastrointestinal	53 (10.7)
	Haematological	117 (23.6)
	Neurological	28 (5.7)
	Renal disease	11 (2.2)
	Respiratory	204 (41.2)
	Other systemic diseases*	41 (8.3)
	Others**	34 (6.9)
<b>Total</b>	<b>495</b>	<b>100.0</b>

\*Other systemic diseases include fever under evaluation, joint pain, diabetes.  
 \*\*Others include poisoning, vaccine preventable diseases, torticollis, admission for surgical procedures, skin infection, drug overdose, etc

**Table 2: Appropriate admission related characteristics of the participants (*n*=495)**

Variables	Appropriate admission (%)	Inappropriate admission (%)	Total
<b>Sex</b>			
Female	173 (87.4)	25 (12.6)	198 (100.0)
Male	265 (89.2)	32 (10.8)	297 (100.0)
<b>Age group</b>			
<1 year	160 (90.4)	17 (9.6)	177 (100.0)
1–5 year	146 (83.4)	29 (16.6)	175 (100.0)
5–10 year	116 (93.5)	8 (6.5)	124 (100.0)
>10 year	16 (84.2)	3 (15.8)	19 (100.0)
<b>Diagnosis</b>			
Cardiological	6 (85.7)	1 (14.3)	7 (100.0)
Gastrointestinal	41 (77.4)	12 (22.6)	53 (100.0)
Haematological	113 (96.6)	4 (3.4)	117 (100.0)
Neurological	26 (92.9)	2 (7.1)	28 (100.0)
Renal disease	8 (72.7)	3 (27.3)	11 (100.0)
Respiratory	183 (89.7)	21 (10.3)	204 (100.0)
Other systemic diseases*	28 (68.3)	13 (31.7)	41 (100.0)
Others**	33 (97.1)	1 (2.9)	34 (100.0)
<b>Distance from residence</b>			
$\leq 5$ km	186 (93.4)	12 (5.05)	198 (100.0)
$> 5$ km	252 (84.8)	45 (15.2)	297 (100.0)
<b>Total</b>	<b>438 (88.5)</b>	<b>57 (11.5)</b>	<b>495 (100)</b>

\*Other systemic diseases include fever under evaluation, joint pain, diabetes.  
 \*\*Others include poisoning, vaccine preventable diseases, torticollis, admission for surgical procedures, skin infection, drug overdose, etc

In the 438 appropriately admitted children, the median LOS at the hospital was 2.5 days (IQR-4, average-  $3.3 \pm 3.2$ , range 0–23). Of them, 333 (76%) children met the criteria of appropriate LOS during their hospital stays and their median LOS was 2 days (IQR-3, average-  $2.7 \pm 2.6$ ). Inappropriate LOS were found to be higher in males (26%) and those living at a distance of >5km from the hospital (25.4%). Majority of the children with inappropriate LOS also didn't have age-appropriate feeding (34.5%) [Table 3]. Furthermore, patients who were admitted with gastrointestinal complications were admitted for longer periods (39%). It was seen that the majority of the inappropriate LOS was due to hospital-related factors like lack of availability of primary health-care services in the nearby areas and delay in receiving results of laboratory investigations (22.8%).

A multivariate logistic regression model [Table 3] showed that keeping other factors constant, the age of the children (AOR = 0.99; 95% CI = 0.98,0.99; *P* value = 0.03), age-appropriate feeding (AOR = 2.12;95% CI = 1.30,3.47; *P* value = 0.003), and hematological disorder (AOR = 0.16;95% CI = 0.05, 0.52; *P* value = 0.002) were found to be associated with the children being kept at the hospital inappropriately. Higher odds of inappropriate LOS was seen among children with gastrointestinal disorders, but no statistical significance was found.

## DISCUSSION

Appropriate admission and length of hospital stay indicate whether the severity of illness or type of clinical or diagnostic services justify in-hospital care for a given patient.<sup>[1]</sup> Inappropriate admission rates vary from country to country and even region to region. The inappropriate admission rate of 11.5% found in the current study is similar to that reported in Australian hospitals (13%) but lower than what has been reported by a study conducted in a British hospital (32%).<sup>[8-10]</sup> In Delhi it was reported as 2.2% whereas in South India as 1.1%.<sup>[6]</sup> These differences might be due to the different sets of criteria utilized in the other hospitals regarding admission of patients; however, it might also be due to the different patient pools that these hospitals serve. The current study was conducted in a tertiary care centre that catered to a large population hailing from some of the remotest areas of Eastern India, who have to travel long distances to reach the hospital. The feeling of need to admit the children by the parents might have contributed significantly to the observed inappropriate admission rate, as evidenced by the significant association observed between the distance of the home of the patient from the hospital and the prevalence of inappropriate admission in them. This has also been reported by Campbell.<sup>[11]</sup> Lack of accessibility to health-care services at lower levels and lack of investigation facilities might also contribute to these inappropriate admissions.

**Table 3: Factors associated with inappropriate length of stay (number of days) at the hospital (n=438)\***

Characteristics	Appropriate LOS, n (%)	Inappropriate LOS, n (%)	Crude odds ratio	Adjusted Odds Ratio** (95% CI)	<i>P</i>
Age (completed months)	47.58±43.36	24.08±29.22	0.98 (0.98, 0.99)	0.99 (0.98, 0.99)	0.03 <sup>a</sup>
Sex					
Female	137 (79.2)	36 (20.8)	0.74 (0.47,1.18)	0.74 (0.46,1.23)	0.25
Male	196 (74.0)	69 (26.0)	1	1	
Age-appropriate feeding					
No	95 (65.5)	50 (34.5)	2.28 (1.45, 3.58)	2.12 (1.30,3.47)	0.003 <sup>a</sup>
Yes	238 (81.2)	55 (18.8)	1	1	-
Distance of residence from hospital					
≤5 km	145 (78.0)	41 (22.0)	0.83 (0.53,1.30)	0.97 (0.59,1.59)	0.91
>5 km	188 (74.6)	64 (25.4)	1	1	
Age-appropriate immunization					
No	39 (86.7)	6 (13.3)	0.45 (0.18,1.11)	1.35 (0.47,3.87)	0.58
Yes	294 (74.8)	99 (25.2)	1	1	
Type of illness					
Cardiovascular	5 (83.3)	1 (16.7)	0.36 (0.03, 3.52)	0.25 (0.02, 2.61)	0.25
Gastrointestinal	25 (61.0)	16 (39.0)	1.15 (0.43, 3.12)	1.29 (0.47, 3.59)	0.61
Hematological	107 (94.7)	6 (5.3)	0.10 (0.03, 0.31)	0.16 (0.05, 0.52)	0.002 <sup>a</sup>
Neurological	21 (80.8)	5 (19.2)	0.43 (0.12, 1.48)	0.37 (0.10, 1.32)	0.12
Respiratory	123 (67.2)	60 (32.8)	0.87 (0.38, 2.02)	0.84 (0.36, 1.98)	0.69
Renal	6 (75.0)	2 (25.0)	0.60 (0.10, 3.55)	0.92 (0.15, 5.69)	0.93
Other diseases	28 (84.8)	5 (15.2)	0.32 (0.09, 1.09)	0.52 (0.14, 1.85)	0.31
Other systemic diseases	18 (64.3)	10 (35.7)	1	1	-
Total	333 (76.0)	105 (24.0)			

\*Inappropriate LOS of stay was only observed among participants who were admitted appropriately. \*\*Adjusted for age of the children, sex of the children, age-appropriate feeding, age-appropriate immunization, distance of residence from hospital, and type of illness. <sup>a</sup>Statistically significant

Even among appropriately admitted children, the prevalence of inappropriate LOS in the hospital was found to be high (24%). Lack of required infrastructure meant that the children, after being discharged from the tertiary care setup, could not be adequately monitored in their local hospitals, thus necessitating increased days of stay at the tertiary setups.<sup>[12]</sup> Delays due to pending investigations and results of investigations and the distance of hospital from home prompted parents to keep their child at the hospital till they could arrange for transportation.

In the current study the lesser the age of the child, the higher the odds of a prolonged LOS. This is in contrast to reports from Europe or North America.<sup>[13-15]</sup> The high prevalence of morbidity and mortality among infants and young children makes doctors overly cautious, leading to inappropriately longer LOS in them.<sup>[16]</sup> Age-appropriate feeding especially during the first 2 years of childhood has paramount importance in growth and health. In its absence nutritional deficits can affect recovery after hospitalization and in turn can increase the hospital stay.<sup>[17]</sup> Other systemic diseases and gastrointestinal diseases were associated with an increased risk of longer LOS, while children suffering from haematological illnesses were the least likely to have inappropriate LOS. This finding conforms with those reported by Bianco *et al.* in Italy.<sup>[18]</sup> Most systemic diseases are chronic in nature, and gastrointestinal diseases present with very vague and non-specific symptoms, that need time to work up.<sup>[19]</sup> However, hematological conditions are comparatively much easier to diagnose and require far fewer tests to assess and have more specific management protocols.<sup>[20]</sup>

## CONCLUSION AND RECOMMENDATION

The current study observed a high proportion of appropriate admission in children. However a higher proportion of inappropriate LOS among them were seen. The younger age group, age-appropriate feeding, and type of illness were found as the primary predictors for inappropriate LOS. Proper assessment before admission using standard protocols can help to mitigate these problems.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## REFERENCES

1. Chang JJ, Chen YC, Gao HX, Zhang Y, Li HM, Su D, *et al.* Effect of

- inappropriate admissions on hospitalization performance in county hospitals: A cross-sectional study in rural China. *Cost Eff Res Alloc* 2019;17:8.
2. Moghadam MN, Amiresmaili M, Goudarzi R, Amini S, Khosravi S. Investigating the appropriateness of admission and hospitalization at a teaching hospital: A case of a developing country. *Iran J Public Health* 2017;46:1720-5.
3. ul Khaliq MA, Yattoo GH, Mufti S, Jabeen U, Malik A, ul Khaliq MI. To study the profile of the patients attending the emergency medicine department of a tertiary care teaching hospital of North India. *Rivista Med* 2021;2021:16-22.
4. Ortiga B, Salazar A, Jovell A, Escarrabill J, Marca G, Corbella X. Standardizing admission and discharge processes to improve patient flow: A cross sectional study. *BMC Health Serv Res* 2012;12:180.
5. Thayyil J, Jeeja MC. Issues of creating a new cadre of doctors for rural India. *Int J Med Public Health* 2013;3:8-11.
6. World Health Organization. Global Health Observatory Data. Geneva: WHO; 2017. Available from: [https://www.who.int/data/gho/data/indicators/indicator-details/GHO/hospital-beds-\(per-10-000-population\)](https://www.who.int/data/gho/data/indicators/indicator-details/GHO/hospital-beds-(per-10-000-population)). [Last accessed on 2020 Jul 05].
7. Das MK, Arora NK, Poluru R, Seth A, Aggarwal A, Dubey AP, *et al.* Pediatric appropriate evaluation protocol for India (PAEP-India): Tool for assessing appropriateness of pediatric hospitalization. *Indian Pediatr* 2018;55:1041-5.
8. Formby DJ, McMullin ND, Danagher K, Oldham DR. The appropriateness evaluation protocol: Application in an Australian children's hospital. *Aust Clin Rev* 1991;11:123-31.
9. Smith HE, Sheps S, Matheson DS. Assessing the utilization of in-patient facilities in a Canadian pediatric hospital. *Pediatrics* 1993;92:587-93.
10. Werneke U, Smith H, Smith IJ, Taylor J, MacFaul R. Validation of the paediatric appropriateness evaluation protocol in British practice. *Arch Dis Child* 1997;77:294-8.
11. Campbell J. Inappropriate admissions: Thoughts of patients and referring doctors. *J R Soc Med* 2001;94:628-31.
12. Kasthuri A. Challenges to healthcare in India-The five A's. *Indian J Community Med* 2018;43:141-3.
13. Kemper KJ. Medically inappropriate hospital use in a pediatric population. *N Engl J Med* 1988;318:1033-7.
14. Gloor JE, Kisson N, Joubert GI. Appropriateness of hospitalization in a Canadian pediatric hospital. *Pediatrics* 1993;91:70-4.
15. Esmain A, Quayle JA, Roberts C. Assessing the appropriateness of paediatric hospital admissions in the United Kingdom. *J Public Health* 2000;22:231-8.
16. International Institute for Population Sciences. National Family Health Survey – 5: India Fact Sheet [Internet]. New Delhi: Government of India. 2021. Available from: [http://rchiips.org/nfhs/NFHS\\_5\\_FCTS/India.pdf](http://rchiips.org/nfhs/NFHS_5_FCTS/India.pdf). [Last accessed on 2023 Oct 13].
17. Lawan UM, Amole GT, Jahum MG, Sani A. Age-appropriate feeding practices and nutritional status of infants attending child welfare clinic at a Teaching Hospital in Nigeria. *J Fam Community Med* 2014;21:6-12.
18. Bianco A, Pileggi C, Trani F, Angelillo IF. Appropriateness of admissions and days of stay in pediatric wards of Italy. *Pediatrics* 2003;112:124-8.
19. Lamps LW. Infectious disorders of the upper gastrointestinal tract (excluding *Helicobacter pylori*). *Diagn Histopathol* 2008;14:427-36.
20. Bansal D, Totadri S. Common hematological disorders in children. *Indian J Pediatr* 2014;81:42-50.