

## Types of Accommodation Anomalies in Children between 4 - 18 Years of Age in Hospital Based Setup Navi Mumbai

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### Abstract

**Purpose:** In children, Accommodative anomalies hinders reading efficiency and many times effect their actual performance in their studies. The main aim here is to find out the accommodative problems like accommodation infacility and accommodation insufficiency in children aged between 4 to 18 years of age.

**Design:** Retrospective descriptive method.

**Methods:** Total numbers 2588 children (1286 female and 1540 male) were examined who visited for their eye checkup at tertiary level eye hospital from 1<sup>st</sup> January 2015 till 31<sup>st</sup> December 2017. RAF ruler, and flippers test were done to find out accommodative abnormalities. The criterion for exclusion were strabismus, amblyopia, nystagmus, retinal disparity, Best corrected visual acuity less than 6/9 or 20/40, corneal pathology and any other significant pathologies involving eyes.

**Results:** Total 91 children (3.51% of 2588) of these children diagnosed to have problems in their accommodation function. Out of 91 only 75 (82.4% of 91) of them had Accommodation infacility, 14 (15.38% of 91) had Accommodative infacility and only 2 (2.19%) of them had Accommodation Spasm. The average age of cohort was 11 years 2 months.

**Conclusion:** Children are most vulnerable at this age. This study also highlights the need to aware the parents about the accommodative anomalies that can occur in their children. Though mostly all the accommodative anomalies has the adequate treatments and the problem can be solved either with the help of glasses or exercises and medicine.

**Keywords:** Accommodative Anomalies; Accommodative Dysfunction; Accommodative Infacility; Accommodation Insufficiency; Children; Refractive Error; Navi Mumbai; India

### Introduction

In the past recent years, Accommodative problems in the younger children is on the rise owing to excessive use of digital gadgets.

Accommodation is defined as “the ability of crystalline lens to change its shape to view images clearer at different distances”. While looking at a distance for an emmetropic person the accommodation would be zero, but when looking at smartphone or reading book the accommodation would be at maximum. Accommodation is the mechanism by which the eye changes focus from distant to near images, is produced by a change in lens shape resulting from the action of the ciliary muscle on the zonular fibers. Academic demands of reading

and writing tasks become higher as one goes higher on the academic ladder and hence the presence of an accommodative dysfunction becomes manifest when near visual tasks are carried out for extended periods. Some children may not be able to complete reading task or assignments and may be easily distracted or be inattentive in class as a result of accommodative dysfunctions [8].

Worldwide, there are over 624.8 million people who are vision-impaired, simply because they cannot access a simple eye examination and pair of glasses, either for distance or near visual impairment. The WHO estimates that out of the 153 million people who live with uncorrected refractive error (this excludes those who are presbyopic) 13 million children (aged 5 to 15) and 45 million working-age adults (aged 16 to 49) are burdened by uncorrected refractive error [2].

## Methods

This retrospective descriptive method of the study consists of the database maintained at a tertiary level eye hospital in the heart of Navi Mumbai, India where patient visited voluntarily for their eye checkup. All 2588 participants were done complete refraction test including vision testing for near and distance and refraction. The criterion for selection were absence of strabismus, amblyopia, nystagmus, retinal disparity, Visual acuity better than 6/9 or 20/40, no corneal pathology and/or any other significant pathologies involving eyes. Vision was recorded on Snellen chart and cycloplegic refraction was done for every patient. Refractive error if any was prescribed and then an orthoptic work up for accommodation was initiated with the full refractive correction in place. NPA was assessed using an RAF ruler. The patient was made to read the near vision chart on RAF rule. The chart was advanced till the first blur was noted and was then receded back to record the point where the smallest letters were seen clearly. Amplitude of accommodation was recorded using Hoffer's formula.

Facility was checked using flippers of +/-1.00D.

If the accommodative facility was less than 6 cycles per minute, or NPA more than 10 cm was considered accommodative insufficiency. All Test were done upon the distance subjective refraction. The results were compared with the Donder's Table of expected and diagnosed accordingly. The below Donder's table of expected was used.

Amplitude of Accommodation and Age (Donder's Table)			
Age (years)	Amplitude (D)	Age (years)	Amplitude (D)
10	14.00	45	3.50
15	12.00	50	2.50
20	10.00	55	1.75
25	8.50	60	1.00
30	7.00	65	0.50
35	5.50	70	0.25
40	5.00	75	0.00

**Table 1**

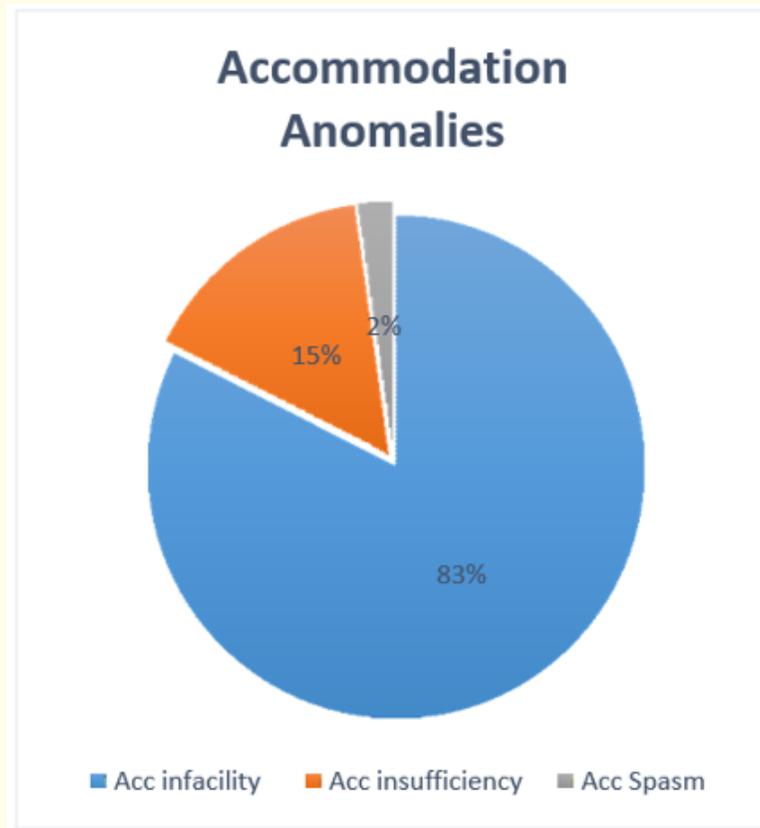
## Results

Out of 2588 patient who visited our hospital from 2014 to 2017, 47.58% were males whereas 52.42% were females. The average age of cohort was 11 years 2 months and SD of 3.58. Total 91 children (3.51% of 2588) of these children diagnosed to have problems in their accommodation function. Out of 91 only 75 (82.4% of 91) of them had Accommodation infacility, 14 (15.38% of 91) had Accommodative insufficiency and only 2 (2.19%) of them had Accommodation Spasm. These 2 patients had intermittent diplopia with high degree of myopia but having no refractive error when refraction were performed under cycloplegia.

The mean Amplitude of Accommodation was 12.04 and the SD of 2.97, mean cpm of flippers was 9.59 and SD of 2.55.

Sex Ratio	Number	%
Male	42	47.58
Female	49	52.42

Table 2



Figure

### Discussion

Comfortable reading and the performance of near point activities involve efficient accommodative and vergence systems. However, accommodative and vergence anomalies are associated with various symptoms that impair efficient near point tasks. Although several studies investigated accommodative-vergence anomalies in school-age populations, their findings were diverse owing to differences in diagnostic techniques and the criteria used to define the variables [7]. Non-strabismic accommodative and vergence binocular anomalies affect clarity and binocularity and impair comfort and efficiency of visual performance when near tasks such as reading, writing and computer-based work is performed [7].

A similar study done at Spain University in the year 2015 titled "Accommodative and binocular dysfunctions: prevalence in a randomized sample of university students" found that Binocular dysfunctions were more prevalent than accommodative dysfunctions or accommodative and binocular dysfunctions together in a randomized population of university students [1].

Another study acclaimed that there is a lack of proper epidemiological studies about the prevalence of accommodative and non-strabismic binocular anomalies [3].

This study is determined to find out the Accommodation Anomalies in children from the age of 4 to 18.

An important finding of this study is that the Accommodative anomalies are not as prevalence to the refractive status of the eye as previously thought. Though the difference between Emmetropes and Ammetropes patient having Accommodative Anomalies in our study is not very high (56.04% vs 43.96%) it is significant that the regardless of the refractive status accommodative anomalies can co-exist. The prevalence of the refractive status in accordance with the Accommodation Anomalies were not measured in this study. So it is understood that even without any refractive error there can still be accommodative problems. Even though the vision is normal or say 20/20 it is recommended that the eyes should be checked for the other accommodative problems.

### Conclusion

Children are most vulnerable at this age. This study gives an unparalleled report of the accommodative anomalies in both male and female child. Though the differences of gender is not much, it is significant that the both gender are equally effected by the condition. This study also highlights the need of awareness for the parents about the accommodative anomalies that can occur in their children. Though mostly all the accommodative anomalies has adequate treatments options and the problem can be solved either with the help of glasses or exercises or medicine. Plus lens has been all time boon for the patient effected with Accommodative insufficiency. Adequate convex lenses provide accommodative support to the patient thus reducing the natural accommodative effort [9]. Flippers exercises has been proven to be as effective as any other treatments modalities for the Accommodative infacility [9].

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