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Comparison Of Interpupillary Distance Between Different Ethnicities - A Cross-Sectional Observational Study

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Abstract

Background: Interpupillary distance(IPD) is the distance between the centers of two pupils. This measurement is necessary for replacing maxillary central incisors in the field of dentistry. **Aim**: To assess and compare the interpupillary distance between the different ethnic populations. **Materials and methods**: The cross sectional study was conducted among undergraduate students of a private dental college and hospital.The anatomical IPD was measured by using a digital vernier caliper. The digital vernier caliper needle was placed on the center of eyebrows and the measurement was taken between two eyebrows which are straight above the center of pupils. Statistical analysis was performed using SPSS Software version 23 by one way anova test. **Result**: There were 149 -participants in the study. About 16%. of them were males and 75% of them were females. The mean inter pupillary distance in south Indian population was assessed to 62.72 +or- SD. The mean interpupillary distance in North Indian Population was 62.52 +or- SD. although it is not significant (P= 0.310). **Conclusion**:The present study records the varied interpupillary distance observed between different ethnicities. Interpupillary distance variations were observed not only by ethnicities but also with different age groups.
Key words: Interpupillary Distance, ethnicities, South Indian population, North Indian population, innovative technology.
Running title: Interpupillary distance between different ethnicities.

INTRODUCTION:

Interpupillary distance is said to be the distance between the center of two pupils(1). It varies from age, gender, race and ethnicities(2)(3,4). It also varies on how you look(looking at closer and far away objects).

In general in myopic and hypermetropic patients the Inter Pupillary Distance differs . Therefore this measurement is taken to match with a perfect optic lens to get a perfect image(5). The IPD is used to correct the ophthalmic lens before the eyes to avoid the strain on eyes due to other lenses(6). IPD is also important for several clinical specialties like oculoplastic surgery, genetics and traumatology. The IPD is also used to find the mesiodistal width of maxillary central incisor in the field of dentistry.

The average Interpupillary Distance in adults is 54-74 mm and in kids is 43-58mm.When IPD decreases it leads to eye pain, headache and nausea. Patients with tropia, cornea disorders,iris anomalies, pupil shape disorders, cataract, lens disorders, vitreous hemorrhage disorders(etc) are excluded from this study(5). There are different ways to measure the interpupillary distance of an

individual out of which there exists two common ways either manually or digitally. The digital vernier is more advantageous than the manual as the digital is more accurate than the manual measurement. IPD can be measured as the distance between the centers of pupils (anatomical IPD) or visual axes (physiologic IPD) on both sides.For guidance in selecting the maxillary central incisors, the interpupillary distance can serve as a guide(3). Our team has extensive knowledge and research experience that has translated into high quality publications (7-26). The aim of this study was to determine and compare the normal anatomical Interpupillary distance values for people of different ethnicities and to ascertain whether a ethnic disparity existed.

MATERIALS AND METHODS:

A cross sectional, observational study was performed by involving students visiting saveetha dental college within the age group of 17-25 years.The given study adopted the anatomical interpupillary distance method. The anatomical IPD was measured by using a digital vernier caliper. The study subject was asked to look straight ahead while the digital vernier caliper needs to be placed on the center of eyebrows. The measurement was taken between two eyebrows which is straight above the center of pupils. After the measurements were taken the subjects were divided as age, gender, ethnicities and measurements. Patients with tropia, cornea disorders,iris anomalies, pupil shape disorders, cataract, lens disorders, vitreous hemorrhage disorders(etc) are excluded from this study(5). . The measurements were done again if there were any mistakes in the device adjustments or if students move or blink their eyes. The data obtained was tabulated and statistical analysis was performed using SPSS Software Version 23.

RESULTS:

A total of 149 subjects participated in the study. About 27 were males(16 % participants in total) and 122 were females (75% participants in total) About 79.86% were of age groups 17-20, about 6.04% were of age groups 21-23 and about 10.08% were of age groups above 23 years.

Table 1:

		Value	df	Asymptotic significance(2-sided)
	Pearson Chi- Square	26.003	5	.000
	Likelihood ratio	24.621	5	.000
	Linear by Linear association	11.031	1	.001
	N of valid cases	149		

Table 2 :

Group Statistics

	Ethnicity	N	Mean	Std. Deviation	Std. Error Mean
Interpupillary Distance	South indian population	78	62.9242	5.03208	.56977
	North indian population	71	62.5177	4.63391	.54994

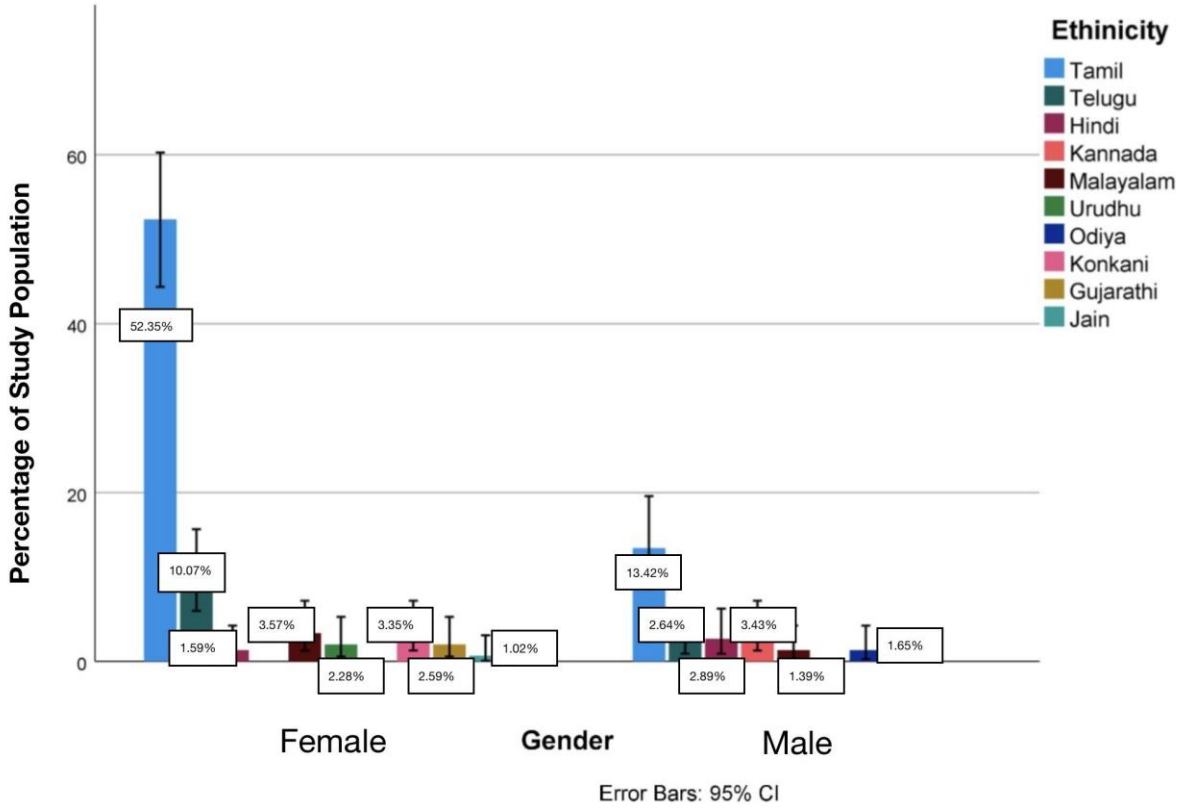

Figure 1: The bar graph depicting the comparison between gender and ethnicity. The x axis depicts gender and y axis depicts the ethnicity.We obtained that the South Indian population has high IPD(Mean=62.92) compared to that of the North Indians (Mean= 62.51) although it is statistically insignificant (p=0.31)(>0.05) (**Table 2)** .

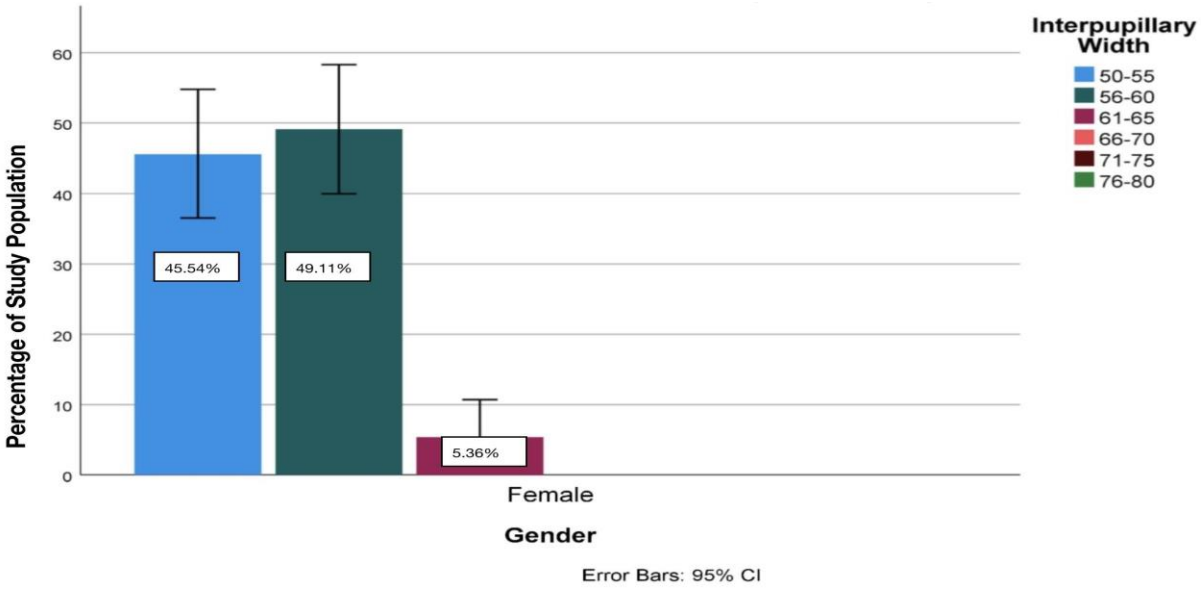

Figure 2: Bar graph depicting the comparison of female gender with the interpupillary distance. The x axis represents gender and the y axis represents Inter Pupillary Distance. About **45.54%** of female students have IPD ranging from 50-55 ,**49.11%** of females have IPD ranging from 56-60 ,**5.36%** of females have IPD ranging from 61-65.

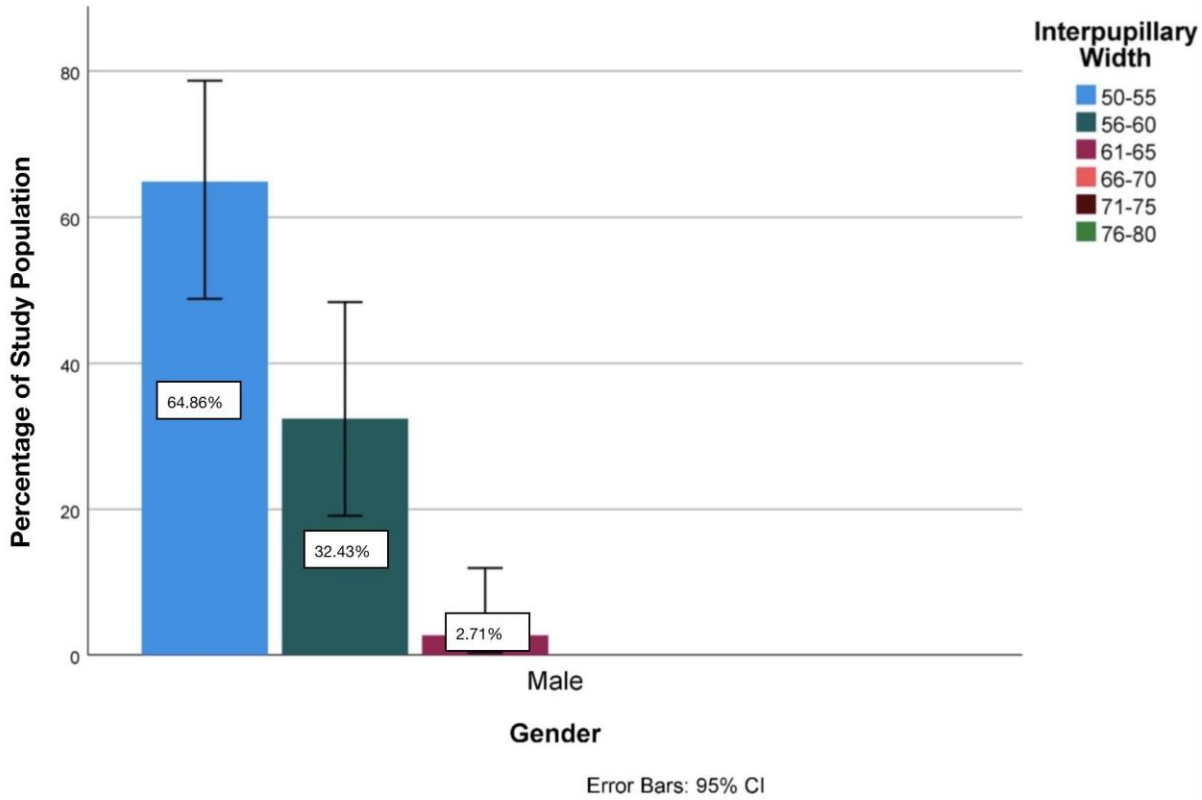

Figure 3: Bar graph depicting the comparison of male gender with the interpupillary distance. The x axis represents gender and the y axis represents Inter Pupillary Distance. About **64.86%** of male have IPD ranging from 50-55 ,**32.43%** of male have IPD ranging from 56-60 and **2.71%** of male have IPD ranging from 61-65.

DISCUSSION:

The present study showed that the IPD of South Indian population is greater than North Indian population although it is not significant.This could be due to the larger number of South Indian population compared to North Indian population and also is done within a particular geographic location. In the evaluation of interpupillary distance in Turkish population it has been proved that establishing of normal values in a population subgroup may be useful in studying orbito-cranial growth patterns, syndrome diagnosis, surgical management of cranio-facial deformities and trauma, and manufacturers of optical frames and lenses to get a perfect image(27). In the comparison of interpupillary distance the mean IPD value of Azerbaijani Turks in both males and females were greater than those of the observed Turkish population in all age groups. The mean IPD values of the Azerbaijani population were found to be greater than those of other ethnic groups based on age , sex, ethnicity, geographical and environmental factors influenced far IPD values(28). The survey on Interpupillary distance in the Egyptian population showed normative data on far IPD and near IPD by different methods in Egyptian people. The study also showed that sex and age had significant effects on IPD. Knowledge of normal values in this population may be useful in studying orbito-cranial growth patterns, syndrome diagnosis, surgical management of cranio-facial deformities and trauma, and manufactures of optical frames and lenses(29).The study on Normal Interpupillary distance in an Iranian population observed increase in IPD after the age of 30 years indicates that factor other than skeletal growth amy affect this parameter(5). In the study of the reliability,validity and normative data of Interpupillary Distance and Pupil diameter using Eye-Tracking Technology the results proved that infrared eye tracking and Right eye IPD/PD test stimuli, accurate measurements of IPD and PD were found.The result of the study obtained from normative data showed an adequate comparison for people with normal vision development(30).

CONCLUSION:

The present study proved that IPD varies not only by ethnicities but also by gender . The difference is not statistically significant due to the small sample size, being unequal in ethnicity and restricted to a particular geographic location. Therefore the given research work needs to be done for a longer time period, in a different geographic location with more number of samples to arrive at a normative data which will help in teeth selection and optimum esthetics.

AUTHOR'S CONTRIBUTION:

Author 1: Dhivya sarathi, carried out the study by collecting data and drafted the manuscript after performing the statistical analysis and in the preparation of the manuscript.

Author 2: Dr. S Gheena and Dr. Sandhya, aided in conception of the topic, designing the study and supervision of the study, correction and final approval of the manuscript.

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CONFLICT OF INTEREST:

The author declares that there was no conflict of interest in the present study.

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