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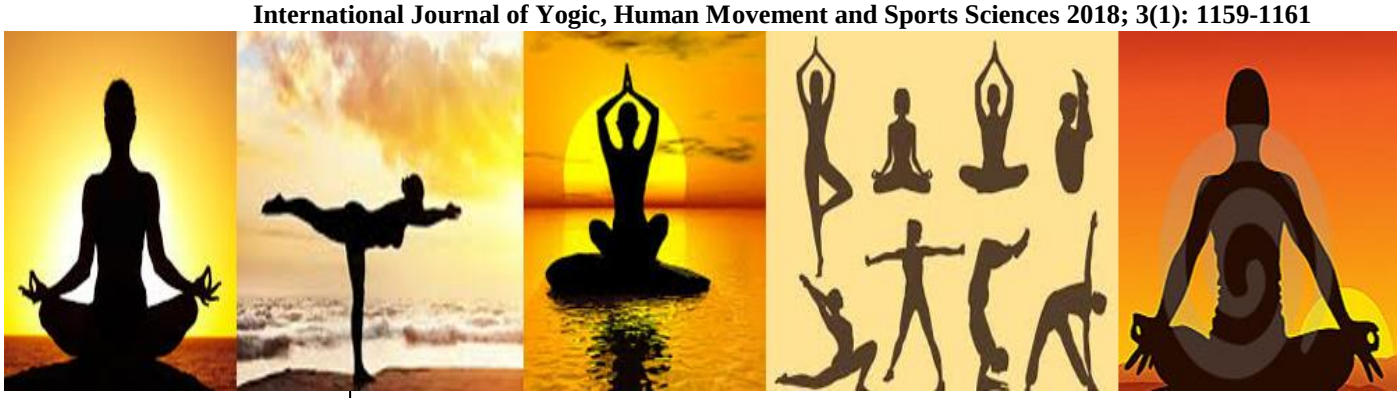

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Correlation between genu valgum and overpronated foot

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Abstract
Background: There were less evidence present on the relationship between knee deformity and foot deformity.
Objective: To examine correlation between knee valgum deformity and overpronation of foot.
Methodology: Design: Observational study; Setting: department of physiotherapy, GJUS&T, Hisar; Study Participants: Ninety seven healthy, college aged participants; Outcome Measure(s): Quadriceps angle, tibiofemoral and navicular drop of the right and left lower extremities. Measurement of Genu valgum was done in stance standing position with standard universal goniometer. Navicular drop was the difference between the height of the navicular in neutral position of subtalar joint in sitting position and standing position and measurement of navicular drop with a ruler was done for each candidate. All measurement was done in standing neutral position with equal weight on both feet. Each reading was taken 3 times.
Results: Mean age of all participants were 19.94±.154 years (Male 19.91±1.79 years; Females 19.96±1.24 years). All participants were completed the data collection procedure. Results findings of study claimed that there was no relations between genu valgum and overpronation of foot but significant relation was found between right valgum & left valgum; right navicular drop and left navicular drop. For both lower limbs, females showed significant higher mean value for genu valgum than males but almost same non-significant mean value for navicular drop.
Conclusions: No significant relationship was found between genu valgum and foot overpronation.

Keywords: Genu valgum, college aged adults, excessive pronation, correlation

Introduction

Well known knee dysfynction involves Genu valgum and Genu varum described by many researchers. Genu valgum also called knock knee deformity involves tibial valgus angulation more than normal during erect position. Genu valgum deformity adversely affects kinematics of lower-extremity kinematics and exaggerates risk of injuries of lower extremity [1-3].

Both knee deformities (Genu varum and Genu Valgum) have impact in increasing shear forces at the compartment medially and laterally at the knee joint, respectively, which can lead to dysfunction of the knee joint and also both deformities affects the location of the center of pressure during stance phase of gait cycle. Moreover, there were few studies that described the relationship between Genu valgum and biomechanics of foot [4, 5].

Many researcher studied closed kinematic chain in which subtalar joint of foot affects the performance of knee joint because abnormal pronatiaon leads to increased internal tibial rotation which further influences quadriceps mechanism by transferring abnormal forces in upward direction disturbing kinetic chain. And also increased tibial internal rotation stresses up anterior cruciate ligament [6, 7].

Sgarlato *et al.* found that excessive pronation at subtalar joint of foot was associated with genu valgum deformity and described that foot abnormality may not only affect the calcaneum of foot but also affect tibia at knee joint [8]. Valmassy *et al.* study findings reveal that excessive angles of deformity in the child leads to shifting of body weight to the medially at foot, resulting in increasea excessive foot pronation [9].

There were less evidence present on the relationship between knee deformity and foot deformity so the Objective of our study was to examine correlation between knee valgum deformity and overpronation of foot.

Methodology

Design: It was an observational study

Setting: We have done the present study at Department of physiotherapy, GJUS&T, Hisar

Study Participants: We recruited ninety seven (18-25 years) healthy, college aged participants

Outcome Measure(s): Outcome measure of study which was used for data analysis was genu valgum and navicular drop of the right and left lower extremities.

Procedure: We recruited participants' college-going students and participant should not have any present or past lower limb injury that would affect the measurement of outcome variables. The selected population consisted of 97 participants (46 males, 51 females). Whole procedure of study was explained to participants asked to sign a consent form prepared by supervisors before data collection starts. Details of Demographics characteristics of participants were taken for each candidate. Measurement of Genu valgum was done in stance standing position with standard universal goniometer. Navicular drop was the difference between the height of the navicular in neutral position of subtalar joint in sitting position and standing position and measurement of navicular drop with a ruler was done for each candidate [10-13]. All measurement was done in standing neutral position with equal weight on both feet. Each reading was taken 3 times.

Data analysis: first normalcy of data was done with help of SPSS version 22.0. The data was not found normal so we had done non parametric test (spearmen's correlation test) to examine correlation between genu valgum and overpronation of foot at p-value ≤0.05.

Results

Mean age of all participants were 19.94±.154 years (Male 19.91±1.79 years; Females 19.96±1.24 years). All participants were completed the data collection procedure. Normality of data was done with Kolmogorov-Smirnova test as shown in table1.

Table1: Test of normality

variable	Kolmogorov-Smirnova test		
	statistic	**df**	**Sig.**
Right Valgum	.180	97	.000
Right NV Drop	.086	97	.073
Left Valgum	.229	97	.000
Left NV Drop	.107	97	.008

Table 2: Descriptive statistics of outcome variables

	Mean	**Std. Deviation**	**N**
Right Valgum	13.72	4.26	97
Right NV Drop	.774	.316	97
Left Valgum	13.44	3.73	97
Left NV Drop	.753	.297	97

Results findings of study claimed that there was no relations between genu valgum and overpronation of foot but significant relation was found between right valgum & left valgum; right navicular drop and left navicular drop as shown in table 3.

Table 3: Spearman's correlation between genu valgum and navicular drop of both legs

Spearman's rho		**Right Valgum**	**Right NV Drop**	**Left Valgum**	**Left NV Drop**
Right Valgum	correlation	1.000.	-.050	.817**	-.155
	Sig.		.627	.000	.130
Right NV Drop	correlation	-.050.	1.000	-.096	.488**
	Sig.	.627		.348	.000
Left Valgum	correlation	.817**	-.096	1.000	-.135
	Sig.	.000	. 348		.187
Left NV Drop	correlation	-.155	.488**	-.135	1.000
	Sig.	.130	. 000	.187	

**. Correlation is significant at the 0.01 level (2-tailed)

For both lower limbs, females showed significant higher mean value for genu valgum than males but almost same non-significant mean value for navicular drop as shown in table 4.

Table 4: Gender differences among outcome variables

	Male (Mean±SD)	**Female(Mean±SD)**	**t-value**
Right Valgum	11.39±3.09	15.82±4.08	-5.97^{***}
Right NV Drop	.793±.277	.756±.349	$.567^{ns}$
Left Valgum	11.63±3.49	15.08±3.17	-5.10^{***}
Left NV Drop	.769±.273	.752±.297	$.533^{ns}$

**. Correlation is significant at the 0.01 level (2-tailed)

Discussion

Purpose of the present study was to examine the relation between genu valgum and overpronation of foot but study findings suggest no relation between these lower limb alignment characteristics.

There was no study evidence that directly reflects relationship between excessive knee valgum and excessive overpronation of foot so that was our aim to reflect this relationship but our hypothesis of study was rejected. The mechanism behind this was not clearly understood.

Study results supported by Kalvouneh M H *et al.* (2016) [14-15] study result that revealed no significant difference in age between the two groups. The mean values of the Q angle and navicular drop for 54 lower extremities with significantly higher than those of control subjects (p<0.001).

Method of navicular drop measurement was approved by Allen K M *et al.* (2000) [16]. They had done an analysis of repeated measures and found intrarater reliability for the

measure of navicular drop with Metrecom to be 0.90; the standard error of measurement was 1.19 mm. The independent t test showed a statistically greater amount of navicular drop in the ACL group and stated that excessive subtalar joint pronation, measured as navicular drop.

Our study findings suggested that females had larger mean value than males for genu valgum but no differences present in navicular drop. It was supported by Nguyan *et al.* (2009) [10]. They claimed that for both the right and left lower extremities, females had greater mean values than males for pelvic angle, femoral anteversion, quadriceps angle, tibiofemoral angle, and genu recurvatum but no differences was found in navicular drop or tibial torsion in both sex.

Conclusion

No significant relationship was found between genu valgum and foot overpronation.

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