

Original Article

Frequency of pelvic asymmetry among medical students of Karachi

Amna Yaseen, Sana Subhan, Taiba Hameed & Saeed Akther

Institute of Physical Medicine and Rehabilitation, Dow University of Health Sciences.

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Corresponding Author Email:

amna_yaseen2011@yahoo.com

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Abstract

Background: Assessment of the pelvis is a complex integration with spine and lower extremities and is prone to multiple dysfunctions. Physiotherapists in routine rarely assess pelvis associated musculoskeletal abnormalities. This study was aimed at finding the frequency of pelvic-asymmetry in medical students of Karachi.

Methodology: An observational cross-sectional study was conducted from 28th November 2017 to 6th February 2018 to measure asymmetry of the pelvis manually. A sample of 154 medical students was calculated through Open Source Epidemiologic Statistics for Public Health (Open Epi) version 3.0 with a confidence level of 95%. Non-probability purposive sampling technique was used. An informed consent was taken and data was collected from participants aged between 18-25 years through a self-generated questionnaire. Participants with Congenital abnormalities or fracture of lower limb or complain of nerve root pain, any spinal pathology/tumor/surgery of lower limb were excluded from the study sample. Data was analyzed using Statistical Project of Social Science (SPSS) version 20.

Results: According to the results 43.5% of the study subjects were observed having pelvic asymmetry. Furthermore, 41.0% participants were spending <3 hours in a constant standing position were observed with the asymmetrical pelvis, while 40.5% participants with pelvic asymmetry work for >3 hours standing constantly. Only 41.5% of participants with low back pain were observed having an asymmetrical pelvis.

Conclusion: It can be concluded from the study results that there is a high prevalence of pelvic asymmetry observed among medical students of Karachi. Moreover, knee and ankle joint pain due to constant standing is highly associated with asymmetrical pelvis as compared to hip pain.

Keywords

Asymmetrical Pelvis, Lower Extremity Pain, Directional Asymmetry (DA), Absolute Asymmetry (AA).



Introduction

Pelvic joint provides stability to the musculoskeletal system and is effective in transferring load between spine and legs. It maintains a connection to the arms, legs and head through muscular, ligamentous and fascial attachments¹. According to a study human pelvis is unique in shape and pelvis is a complicated bone due to its landmark but functionally it is very important to bone and aids in mobility of the human body². The action of the forces on the pelvic bone is complicated due to its framework³. The pelvis appears to be the most important axis of the sagittal balance of the spine because it also maintains the curves of spine⁴.

Pelvic asymmetry is assessed through measurement of right and left iliac and sacral bones^{5&6}. Individuals with unequal loads, which are applied as mechanical shock, have greater chances for occurrence of pelvic asymmetry as compared to the normal healthy individuals⁷. With this aspect, the pelvic asymmetry is considered as the modified physiological adaptation of the human body motion system to compensate for the unequal mechanical loads⁷.

It has been suggested that asymmetry of the pelvis can cause musculoskeletal pain and abnormalities like low back pain (LBP), increased lumbar lordosis and sacroiliac joint dysfunction, by changing the human body mechanics⁸⁻¹¹. Worldwide in many clinical setups examinations for pelvic asymmetry are very frequent because of its evident association with musculoskeletal abnormalities¹².

Asymmetry of the human axial skeleton has got much less consideration than that of the appendage skeleton¹³. Pelvic morphology is

subject to numerous specific components, counting bipedal movement and obstetrics, among others, as well as natural variables such as biomechanical stacking. However, the impact of these different components on the asymmetry of the pelvis is obscure and few studies have examined the types of pelvic asymmetry. Little difference is found in sex % DA and % AA of the pelvis and no difference is observed in various population, however, biomechanical loading of the pelvic girdle influence asymmetry of canal and non-canal aspects of pelvis, but these asymmetries negatively affect obstetric function as given the prevalence of % DA in this referred study¹³.

Studies revealed that individuals with lower levels of gross motor function limitations have more postural asymmetries in sitting position than when standing, and these asymmetries are related with windswept hip distortion and a spinal abnormality like scoliosis¹⁴. In sitting posture, the ipsilateral side of the pelvis goes up and in a forward direction, coordinating the trunk to the contralateral side. Horizontal spinal movement and flow are required to compensate for the asymmetry caused by pelvic obliquity.

Delayed pelvic asymmetry can lead the individual particularly ladies to Unremitting Pelvic Torment and chronic low back pain (CLBP)¹⁵. This torment is localized to the anatomic pelvis, the front stomach divider underneath the umbilicus, or the lower back. Depending upon the characteristics of the population the prevalence of the CLBP may vary from $\leq 39\%$ ¹⁵. It is evident that movement including trunk revolution increases the hazard of back torment by 1.51–2.28 times.

In order to report the association of pelvic asymmetry with musculoskeletal abnormalities, it is important to first determine the frequency of pelvic asymmetry among the asymptomatic population. Globally, different studies had been conducted in order to determine the frequency of pelvic asymmetry through different methods that includes radiographs (considered gold standard), computed tomography scans (CT Scans), Pelvic Inclometers, manual and visual methods but, locally there are not many evidences found on assessment frequency of pelvic asymmetry^{5,12&16}.

There are very limited studies conducted on assessment of pelvic asymmetry manually. The lack of researches on this specific topic has elicited the need to look over the frequency of pelvic asymmetry. Therefore, the purpose of the study was to find the frequency of pelvic asymmetry among medical students of Karachi so that future researchers can work on the preventive measure and overcome this problem.

Methodology

An observational cross-sectional study was conducted from 25th Nov 2017 to 6th Feb 2018 to assess the pelvic asymmetry manually. Sampling was done through non-probability purposive sampling technique. A sample size of 154 was calculated by Open Epi version 3.0 with a hypothesized frequency of 11.3% (frequency of pelvic asymmetry) attribute of student's design effect of 1% and confidence level 95%. 18-25 years old medical students of Dow University of Health Sciences (DUHS),

Shaheed Mohtarma Benazir Bhutto Medical College (SMBBMC) and Jinnah Postgraduate Medical Centre (JPMC) were recruited. An informed consent was taken prior to the study; data was collected using a self-generated closed-ended questionnaire.

The questionnaire included demographics, questions regarding sitting and standing hours, pelvic asymmetry associated pains, to assess the LBP, hip pain and the assessment of pelvic symmetry. Individuals with the congenital deformity of the spine, hip pelvis or lower limb, and any spinal, hip, pelvic or lower limb injury, fracture, tumor, nerve root pain were excluded from the study sample.

Pelvic asymmetry was assessed manually by visual evaluation method published previously¹⁶. Data was analyzed using SPSS Version 20. Frequencies and the percentages were taken out for all qualitative variables. Descriptive statistics such as the means and standard deviations were reported for the quantitative variables. The results were presented as odds ratios (OR) with 95% confidence interval (95% CI).

Results

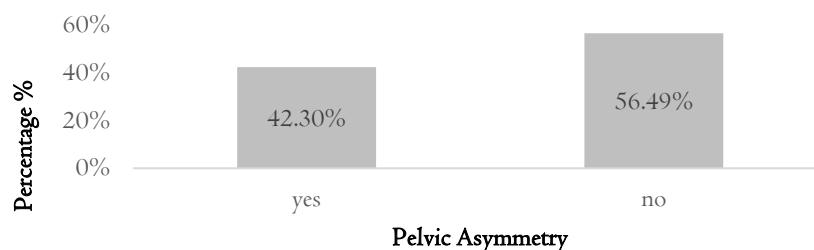
A total of 154 medical students were selected out of which 84.4% of the participants were female and only 15.6% were male i.e. in the ratio of 1:5.4.

Table I shows OR and 95% CI for asymmetrical pelvic which is dependent on the gender, effects of constant sitting hours and standing hour and the complaints of pain (LBP at the pelvis, hip, knee, and ankle joint).

Table I: Association of pelvic asymmetry with gender, sitting & standing postures and pain.

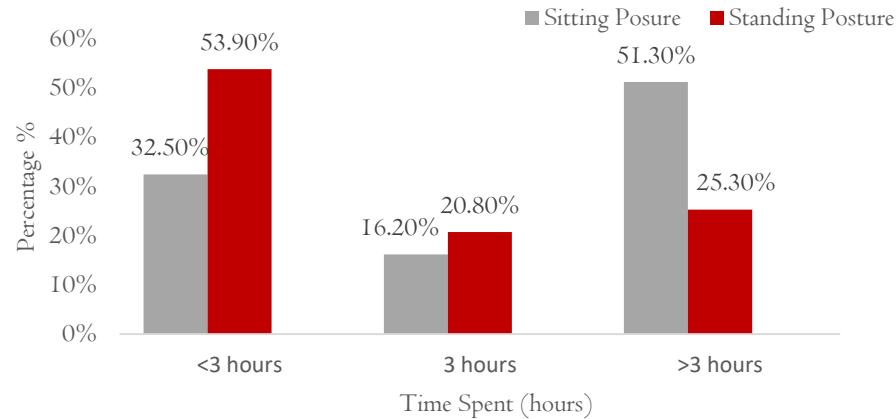
	Asymmetrical Pelvic				Odd ratio (OR)	(95 % C.I)	p-values
	No		Yes				
	n	%	n	%			
Gender							
Female	75	57.7	55	42.3	1	----	0.485
Male	12	50.0	12	50.0	1.364	(0.570 -3.263)	
Siting hours for constantly							
<3 hours	25	50.0	25	50.0	1	----	0.529
3 hours	15	60.0	10	40.0	0.667	(0.252 -1.765)	
>3hours	47	59.5	32	40.5	0.681	(0.334 -1.390)	
Standing hours for constantly							
<3 hours	49	59.0	34	41.0	1	----	0.723
3 hours	18	56.2	14	43.8	1.12	(0.492 -2.55)	
>3 hours	20	51.3	19	48.7	1.36	(0.637 -2.94)	
Low back pain							
No	56	55.4	45	44.6	1	----	
Yes	31	58.5	22	41.5	0.883	(0.451 -1.731)	0.717
Hip pain in standing or sitting							
No	77	56.6	59	43.4	1	----	0.932
Yes	10	55.6	8	44.4	1.044	(0.388 -2.809)	
Knee pain in standing							
No	80	57.6	59	42.4	1	----	
Yes	7	46.7	8	53.3	1.550	(0.532 -4.512)	0.419
Ankle pain in standing							
No	75	56.8	57	43.2	1	----	0.82
Yes	12	54.5	10	45.5	1.096	(0.443 -2.716)	

Graph I: Distribution of the participants with Pelvic asymmetry.



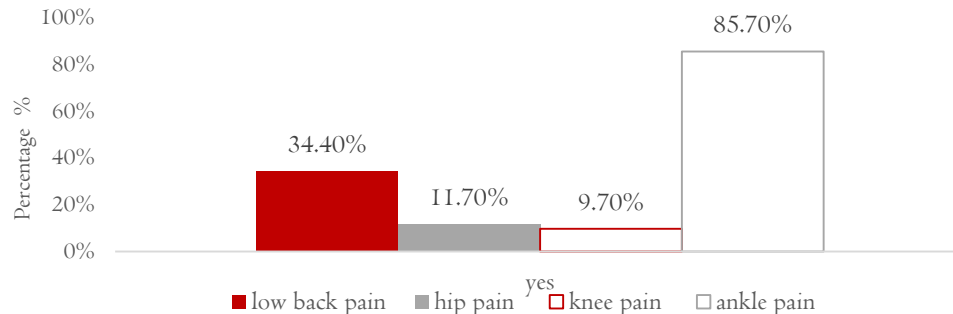
The asymmetric presentation of the pelvis was found in 42.30% of the study subjects, whereas 56.49% of subjects were observed having no pelvic asymmetry as shown in graph I.

Graph 2: Distribution of the participants on the basis of hours spent in sitting & standing posture.



According to the results shown in graph 2, 51.3% of participants were spending more than 3 hours in constant sitting posture while 25.30% of the study subjects were spending more than 3 hours in standing position. 32.5% of participants were sitting for less than 3 hours and 53.9% were spending less than 3 in standing posture.

Graph 3: Graphical representation of subjects with low back pain, knee pain, hip pain & ankle pain.



Graph 3 shows that 85.7% of the study population was observed with ankle pain while 34.4% with low back pain, 11.7% with hip pain and only 9.7% of the population had pain in their knees.

Discussion

With the concurrent interest in the assessment of pelvic asymmetry and in particular to determine its frequency, this study was conducted on the medical students of Karachi. Participants between the age group 18-25 years were recruited. According to the study results, 43.5% participant exhibited pelvic asymmetry (Graph I). On

the other hand, M. Drnach conducted his study on the children with an age group of 7-12 years and found that 6 children out of 53 i.e. 11.3% were present with pelvic asymmetry. Various studies concluded that pelvic asymmetry is more prevalent in developing children^{16&17}.

The study sample had a lesser number of males as compared to females that is why results showed a high prevalence in males

(OR 1.364) (Table I). Pelvic asymmetry was found in 42.3% females and 50.0% males (Graph 1). In contrast to our results, Herington and his colleagues observed neutral pelvic tilt 9% in males and 18% in females out of 120 healthy individual¹². But this study results cannot be generalized on the basis of high prevalence in males as there were limited males in the study sample.

There are several methods adopted by researchers for the assessment of pelvic asymmetry. Among the various reliable methods of the assessment of the pelvic asymmetry, radiographic assessment of the pelvic asymmetry is considered as a gold standard⁵. Chris and his colleagues conducted a study to measure the pelvic tilt among the teenagers, by digital pelvic inclinometry (DPI) to check its reliability¹⁸. His study revealed that a DPI is a reliable option in measuring the pelvic tilt¹⁸. Another study was used to assess the asymmetry of the pelvis by the 3-dimensional measurements, with an electromagnetic Fastrak system. It included 71 paired variables, in which 15 variables were significantly asymmetric at the region of the sacrum, iliac blades, iliac width and acetabulum.

There were only 7 variables, asymmetric at the area of the pelvis. The study concluded that in clinical examinations by measuring iliac crest orientation, the pelvic asymmetry may be evaluated¹⁹. M. Drnach (and research coworkers) used the manual method to assess the frequency of frontal plane pelvic postural asymmetry¹⁶. According to researchers the reliability and the specificity of the manual is still questionable¹⁶. The same method is used to assess the pelvic asymmetry in the current study. Therefore, the significance of the results is debatable due to human error²⁰.

It is evident from the previous literature that LBP is associated with the pelvic asymmetry^{19,21&22}. Al-eisa et al., found that

pelvic asymmetry was associated with the LBP due to the higher stress on the lumbar spine in sitting position¹⁸. Results of our study showed that 65.6% participants with the LBP had pelvic asymmetry (Graph 3) but there is no direct association present between LBP and a pelvic asymmetry OR 0.883 (0.451 -1.731) (Table I) However, it was found that hip pain in standing constantly, knee pain and ankle joint pain due to constant standing is associated with asymmetrical pelvis with an odds ratio of 1.044, 1.550 and 1.096 respectively (Table I). To investigate the effect of the foot hyper-pronation on the pelvis and the lower limb alignment in standing, a study was conducted on 35 healthy subjects, in four different ways: feet flat on the floor and on wedges angled at 10°, 15°, and 20°, with hyper-pronation. It was found that the alignment of the foot has a great effect on the alignment of the lower extremity and the pelvic bone²³.

Levine et.al found that the alignment and the position of the foot has a greater effect on the alignment of lower extremities and pelvic bone²² and leads to musculoskeletal abnormalities²³⁻²⁵. The outcomes of this study suggested that there is a statistical noteworthy association between hip, knee and ankle pain with musculoskeletal problems due to constant standing and sitting.

Conclusion

It can be concluded that there is a moderate frequency of pelvic asymmetry among medical students of Karachi. The results may vary as more reliable tools of assessment are required to predict the accurate frequency of pelvic asymmetry.

Conflicts of Interest

None.

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