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IS PELVIC ORGAN SUPPORT DIFFERENT BETWEEN YOUNG NULLIPAROUS AFRICANS AND CAUCASIANS?

Hypothesis / aims of study

There seems to be substantial variation in the prevalence of pelvic floor disorders between different ethnic groups (1). This may partially be due to differences in pelvic floor structure and functional anatomy. To date, information on this issue is sparse, although comparative studies have shown substantial differences between Caucasians and East Asians (2). The aim of this study was to compare hiatal dimensions, pelvic organ descent and levator biometry in two groups of young, healthy nulliparous Caucasians and Africans.

Study design, materials and methods

Healthy nulliparous nonpregnant volunteers attending a local nursing school in Uganda were invited to participate in this study. All volunteers underwent a simple physician- administered questionnaire and a 4D translabial ultrasound examination in the supine position after bladder emptying at rest, on Valsalva and on pelvic floor muscle contraction (PFMC) as previously described(3) using a GE Voluson i ultrasound system with RAB of 4-8Mz. Hiatal dimensions, pelvic organ descent and levator muscle thickness were assessed offline on a desktop PC using a proprietary software (4D view v10) as previously described (3). Hiatal diameter and area were assessed at the plane of minimal hiatal dimensions (Fig 1). Maximum muscle thickness is determined by slowly moving the plane of minimal hiatal dimensions cranially until the plane of maximal thickness of the levator muscle is reached. In the axial view, we measured maximum diameters of the puborectalis muscle in two locations bilaterally and determined muscle area by tracing its outline at the level of maximal muscle thickness. Pelvic organ descent was measured on maximum Valsalva maneuver relative to the posteroinferior margin of the pubic bone. To compare findings with those obtained in nulliparous nonpregnant Caucasians, we retrieved the 3D/4D ultrasound volume datasets of two previously published studies. All volume data sets were analysed by the first author, blinded against all clinical data. Sample size calculations were not performed due to an absence of pilot data in the literature.

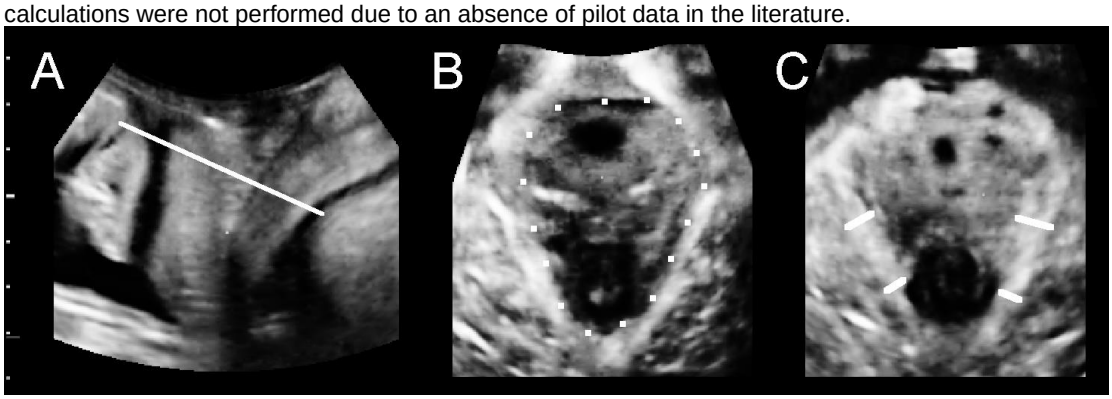

Figure 1: Mid-sagittal translabial pelvic floor ultrasound (A), showing the location of the plane of minimal dimensions used for determining hiatal diameters and areas (oblique line in A), the corresponding axial view (B) with the dotted line outlining hiatal area, and the plane of maximum muscle thickness (C), which usually is 0.5-1 cm cranial to the plane of minimal dimensions, with lines showing muscle thickness in paravaginal and pararectal locations.

Results

In total 78 nursing students were recruited. Two were parous and were therefore excluded from analysis, leaving 76 for analysis. The datasets of 66 nulliparous Caucasians were identified from the above 2 published studies. Six of the Caucasians reported stress urinary incontinence, 1 urge incontinence and 2 mixed urinary incontinence, but none of the African volunteers complained of urinary incontinence. None of the subjects in either cohort had a history of pelvic floor surgery or intervention for a pelvic floor disorder. The demographic characteristics, hiatal dimensions, measures of levator muscle bulk and pelvic organ descent of the 2 groups are shown in Table 1. All measures of hiatal dimensions and pelvic organ descent were significantly higher in the African group. Muscle thickness and area were, however, not significantly different between the 2 groups. There was a significant correlation between hiatal areas at rest and on Valsalva and pelvic organ descent in all 3 compartments as previously demonstrated. Exclusion of the 9 Caucasians with symptoms of incontinence did not materially alter results.

	Caucasians (n=66)	**Africans (n=76)**	**P value**
Age (years)	22.9 (5.09)	21.2 (3.7)	0.03
BMI	23.77 (4.14)	22.61 (2.99)	0.07
Anteroposterior hiatal diameter at rest (cm)	4.67 (0.72)	5.73 (0.73)	<0.001
Lateral hiatal diameter at rest (cm)	3.61 (0.46)	3.78 (0.55)	0.046
Anteroposterior hiatal diameter on Valsalva (cm)	5.01 (0.87)	6.59 (1.14)	<0.001
Lateral hiatal diameter on Valsalva (cm)	4.08 (0.58)	4.43 (0.75)	0.003
Hiatal area at rest (cm^2)	11.9 (2.57)	15.66 (3.27)	<0.001

Hiatal area on PFMC (cm^2)	9.97 (2.14)	12.54 (2.43)	<0.001
Hiatal area on Valsalva (cm^2)	15.72 (5.57)	23.15 (7.66)	<0.001
Maximum muscle thickness at rest (mm)	6.59 (1.01)	6.34 (1.22)	0.18
Maximum muscle area at rest (cm^2)	6.77 (1.42)	7.02 (1.66)	0.32
Bladder neck descent (mm)	13.5 (10.5)	25.3 (8.5)	<0.001
Bladder descent (mm)	16.2 (9.37)	23.4 (8.7)	<0.001
Uterine descent (mm)	39.3 (13.1)	27.1 (20.7)	<0.001
Rectal descent (mm)	11.3(17.6)	-8.9 (11.6)	<0.001

Table 1: Demographic data and sonographic measures of functional pelvic floor anatomy. Values are mean (SD). Bladder neck descent is a measure of bladder neck mobility. Bladder/uterine/rectal descent denotes position of the respective organ relative to the symphysis pubis. A negative value signifies position below the symphysis.

Interpretation of results

In this comparative study on two cohorts of nonpregnant nulliparae, Ugandans were found to have a significantly larger levator hiatus and greater pelvic organ descent than Caucasians. This implies greater distensibility of the levator ani muscle and higher elasticity of fascial support structures. This difference, while not unanticipated, is of unexpected magnitude. Hiatal distensibility as determined by average hiatal area on Valsalva in Ugandans was found to be more than one standard deviation higher than in Caucasians, and differences of a similar magnitude were found for pelvic organ mobility. Muscle thickness and area, on the other hand, were similar between the groups.

While other causes such as lifestyle factors and nutrition may also be responsible, it appears likely that these differences in functional anatomy are at least partly genetic in nature. Implications for childbirth- related fascial and muscular trauma are likely to be complex and deserve further study.

Concluding message

Substantial differences between Caucasian and Ugandan nonpregnant nulliparae were identified in this study comparing functional pelvic floor anatomy.

References

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Disclosures

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