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Dependence between Age at Menarche, Body Composition and Selected Somatic Indices

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ABSTRACT

The aim of this paper is to analyse age at menarche in Tanzanian girls for associations with body composition and selected somatic indices. The study included 97 girls (71 post-menarche and 26 pre-menarche). Measurements were taken of body height, body weight, waist and hip circumferences. Body composition was analysed for percentages of body H_2O, fat, and muscle. The girls' nutritional status and body fat distribution were assessed using the following somatic indices: BMI, WHR (Waist-to-Hip Ratio) and WHtR (Waist–to–Height Ratio). For the post-menarcheal group N=71, backward stepwise multiple regression analysis was performed. Average age at menarche calculated using the recall method for N=71 was $\bar{X}$=14.29 years, calendar age $\bar{X}$=15.92 years. More than half (57.69%) of the girls in the pre-menarche group had not reached the body weight of 48kg, whereas in the post-menarche group they accounted for 32.39%. As many as 97.18% of the post-menarche girls had body fat content of 22%, compared to 88.46% in the pre-menarche group. In terms of BMI, 74.65% of post-menarche girls had healthy weight, compared to 73.08% in the pre-menarche group. There were no significant differences in WHR or WHtR, which may indicate similar fat distribution in girls prior to and after menarche. The analysis showed that the onset of menstruation is not strictly dependent on reaching a critical point in body weight or body composition.

Key words: *menarche, body build, body composition, anthropometric indices*

Introduction

Age at menarche is often affected by low body fat content and/or low body weight. Nearly half a century ago, Frisch and Revelle[1] suggested that body weight of 48 kg and body fat percentage of 22% constitute »critical thresholds« playing a key role in metabolic and hormonal processes responsible for the onset of menstruation. Subsequent research on this topic is not sufficient to challenge this theory, but at the same time there have been no longitudinal studies to support it. Undeniably, there is a link between age at menarche and the physical development and body build[1–4].

Studies have shown that girls who are overweight during childhood and puberty grow faster and reach menarche at an earlier age.[5,6,7,8,9] On the other hand, girls who have their menarche relatively early and who are not necessarily overweight tend to gain excess weight later in adulthood[10,11].

In the developed countries, with a high standard of living, menarcheal age between 1830 and 1980 dropped at an average rate of approx. 3–4 months per decade.[12,13] Ultimately, age at menarche reached 12.5–13.0 in the 1990s, and since then the process has been observed to stabilise (halt)[14] and even to reverse in some populations[15,16].

Studies show that menarcheal age is correlated with direct and indirect effects of multiple factors. Factors directly influencing age at menarche are primarily of genetic nature[17,18]. In turn, socio-economic, socio-cultural and even socio-political factors interact synergistically to exert an indirect influence on the onset of menstruation.

Socio-economic factors include those elements of the environment which determine the living conditions in a given group: nutritional status, health condition, number of siblings and birth order, education level, parents' income and education, place of residence[19–22]. Age at menarche is also affected by the socio-political situation in the country. Political instability impacts nutrition, stress, access to healthcare, illnesses, fear of sexual aggression, etc.[23,24].

Many studies identify nutritional status as the strongest factor directly and indirectly affecting menarche, as it is related to body weight and body fat content as well as

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the level and dynamics of biological development[25,26]. The aim of this paper is to analyse age at menarche in Tanzanian girls for associations with body composition and selected somatic indices.

Materials and Methods

Subjects

The research sample examined for menarcheal status was a group of female students from Tanzania (N=71). The inclusion criteria included informed consent granted by the girls after the purpose of the study was presented to them. The girls agreed to anthropometric measurements and completed a questionnaire – voluntarily and independently – which included a question on the time of their first menstruation. All girls belonged to the Bantu language group.

Anthropometric measurements were taken for a total of N=97 girls, but 26 of that number had not had their first menstruation yet. The average calendar age and age at menarche was calculated for post-menarche girls. The date of the first menstruation was provided by the participants on an »as recalled« basis, in some cases with great detail, while other girls only provided the calendar year and month. Data were verified for correctness by teachers or carers, as long as it did not infringe on the participants' privacy and intimacy.

Anthropometric data

Body height measurements (B-v) [in cm] were taken with an anthropometer and body weight was measured [in kg] using electronic weighing scales SOEHNLE (model 63671 Chicago Silver Body Balance Scale B000FL3H3G), with an accuracy of 100 g. The application of weighing scales using the bioimpedance technology made it possible to gather body composition data, including the percentages of H_2O, fat, and muscle in the body. Waist and hip circumferences were measured using a metric tape [in cm]. All measurements were performed in compliance with anthropometric technique[27].

The participants' nutritional statuses and body fat distribution were assessed according to the following indices: Body Mass Index (BMI), Waist-to-Hip Ratio (WHR) and Waist–to–Height Ratio (WHtR). The Body Mass Index (BMI=kg/m^2) is generally accepted as the leading indicator for assessing nutritional status, and it was used to assign the girls to predefined categories. Interpretation of results: BMI <16.00 indicates grade 3 thinness; BMI 16.00–16.99 indicates grade 2 thinness; BMI 17.00–18.49 indicates grade 1 thinness; BMI 18.50–24.99 is the normal (healthy) range; BMI 25.00–29.99 indicates grade 1 overweight; BMI 30.00–39.99 indicates grade 2 overweight; BMI 40.00≥ indicates grade 3 overweight.[28] WHR = waist circumference [cm]/hip circumference [cm] in women indicates visceral fat accumulation (android type) when the ratio is ≥0.8. WHtR = waist circumference[cm]/(B-v)[cm]x100 is interpreted according to the following categories for women: ratio less than <34: extremely slim, ratio 35 to 41: healthy slim, ratio 42 to 48: healthy, ratio 49 to 53: overweight, ratio 54 to 57: very overweight, ratio 58+: morbidly obese[29]. The assessment of the participants' nutritional status according to BMI, WHR and WHtR was used to find out whether the group under analysis was affected by the problems of excessive weight and adiposity, and to identify the extent to which body weight was associated with biological maturity and menarcheal age.

Statistical analysis

The data were statistically analysed using the software package Statistica made by StatSoft, Inc.[30]. The arithmetic mean $\overline{X}$, standard deviation (SD) and minimum–maximum range (min-max) were calculated for each of the studied parameters. The variables included in the analysis (calendar age, body height, body weight, %H_2O, %fat, %muscle) divided into pre-menarche and post-menarche group demonstrated statistically significant differences from normal distribution (t tests). Further analysis involved non-parametric tests. To analyse the differences between the studied groups, the non-parametric Mann-Whitney test was used. The level of significance was taken as $p \leq 0.05$.

In the post-menarche group N=71, backward stepwise multiple regression analysis was performed to determine the extent to which anthropometric data and the somatic indices calculated from them impact age at menarche. Age at menarche was defined as a dependent variable affected by: calendar age, body height (B-v), body weight, %water, %fat, %muscle, BMI, WHR and WHtR. In the subsequent stages (steps) of analysis, the variables which are correlated insignificantly are eliminated out of the equation, and the statistical significance of the remaining variables is tested at each step to reveal the cause-and-effect relationships among the variables included in the equation. The final result (adjusted R^2) is not always higher than those at the preceding stages because once a variable is eliminated, the remaining variables are rearranged and new synergies/relations among them may emerge. By applying this technique, the strength of impact the individual variables included in the model have upon age at menarche can be assessed in a comprehensive manner.

Ethical consideration

The study involved a non-invasive approach. The school principals verified the objective of the study. The final decision to take part in anthropometric measurements was left to the young people. The study was explained to the participants in Swahili, the local language.

Results

Age at menarche

Age at menarche in the post-menarche group N=71 calculated using the recall method was $\overline{X}$=14.29 years (±1.13) and ranged from 11.00 to 17.33 years.

Anthropometric data

The average calendar age of all the participating girls N=97 was $\overline{X}$=15.42 years (±1.87) falling within the range 12.44–22.72 years, mean body height was $\overline{X}$=153.14 cm (±5.54), and mean body weight $\overline{X}$=50.26 kg (±7.60). The average calendar age of post-menarche girls n=71 was similar $\overline{X}$=15.92 years (±1.87), their mean body height $\overline{X}$=154.16 cm (±5.01) and mean body weight $\overline{X}$=51.58 kg (±6.90). In the pre-menarche group N=26, the average age was $\overline{X}$=14.04 years (±0.98), with body height $\overline{X}$=150.34 cm (±6.04), and body weight $\overline{X}$=46.65 kg (8.37) (Table 1). In the pre-menarche group, more than half of the girls (57.69%) had not reached the body weight threshold of ≥48 kg, but as many as 88.46% in the same group were characterised by body fat content of ≥22%. In the post-menarche group, 32.39% of girls had not reached ≥48 kg in body weight, but as many as 97.18% of the participating girls from this group were characterised by body fat percentage of ≥22% (Table 2). The Mann-Whitney U test for the following variables in the post-menarche and pre-menarche groups: calendar age, body height and weight, body water, fat and muscle percentages, revealed statistically significant differences. The Z statistic for the Mann-Whitney U test amounted to: –4.980 (p=0.000), –2.822 (p=0.005), –3.164 (p=0.002), 3.221 (p=0.001), 2.989 (p=0.003) respectively for: calendar age, body height, body weight, % water and % muscle.

Somatic indices: BMI, WHR and WHtR

The average BMI in the post-menarche group N=71 was $\overline{X}$=21.69 (±2.67) and BMI scores fell within the range from 16.89 to 28.54 (Table 1). A clear majority in this group of participants (74.65%) were characterised by normal nutritional status according to the BMI scale. Based on BMI scores, 11.27% of participants in the same group were undernourished, while 14.08% were overweight (Table 2).

TABLE 2
SELECTED ANTHROPOMETRIC AND SOCIO-ECONOMIC DATA

	All together (N=97)	Pre-menarche girls (N=26)	Post-menarche girls (N=71)
	N(%)	N(%)	N(%)
Body weight (kg)			
<48	38(39.18)	15(57.69)	23(32.39)
≥48	59(60.82)	11(42.31)	48(67.61)
Body fat percentage in body weight			
<22%	5(5.15)	3(11.54)	2(2.82)
≥22%	92(94.85)	23(88.46)	69(97.18)
BMI			
<16.00	1(1.03)	0	1(1.41)
16.00–16.99	2(2.06)	1(3.85)	1(1.41)
17.00–18.49	11(11.34)	5(19.23)	6(8.45)
18.50–24.99	72(74.23)	19(73.08)	53(74.65)
25.00–29.00	11(11.34)	1(3.85)	10(14.08)
WHR			
<0.8	15(15.46)	4(15.39)	11(15.49)
≥0.8	82(84.54)	22(84.61)	60(84.51)
WHtR			
<34	0	0	0
35–41	3(3.09)	3(11.54)	0
42–48	47(48.45)	12(45.15)	35(49.30)
49–53	39(40.21)	10(38.46)	29(40.85)
54–57	7(7.22)	1(3.85)	6(8.45)
58+	1(1.03)	0	1(1.40)

BMI – Body Mass Index; WHR – Waist-to-Hip Ratio; WHtR – Waist-to-Height Ratio

TABLE 1
ANTHROPOMETRIC MEASUREMENTS AND SOMATIC INDICES OF PARTICIPANTS ACCORDING TO MENARCHEAL STATUS

	All together (N=97)			Pre-menarche girls (N=26)			Post-menarche girls (N=71)		
	$\overline{X}$±SD	median	Min-Max	$\overline{X}$±SD	median	Min-Max	$\overline{X}$±SD	median	Min-Max
Calendar age	15.42±1.87	15.14	12.44–22.72	14.04±0.98	13.95	12.44–16.37	15.92±1.87	15.71	12.86–22.72
Body height (cm)	153.14±5.54	152.80	138.80–166.40	150.34±6.04	150.85	138.80–163.20	154.16±5.01	153.60	141.80–166.40
Body weight (kg)	50.26±7.60	49.60	35.00–73.10	46.65±8.37	45.65	35.00–73.10	51.58±6.90	51.20	38.60–66.80
% water	55.37±4.39	54.60	47.60–66.60	58.10±4.86	59.05	48.60–66.60	55.11±4.25	54.10	47.60–65.70
% fat	30.77±5.33	30.60	19.00–43.50	29.66±6.62	28.45	19.30–40.70	30.82±5.14	30.80	19.00–43.50
% muscle	40.82±4.18	39.90	34.60–60.00	42.41±3.78	42.50	35.60–53.10	40.95±4.51	39.80	34.60–60.00
BMI	21.40±2.79	21.51	14.84–29.66	20.58±2.99	20.47	14.84–29.66	21.69±2.67	21.67	16.89–28.54
WHR	0.79±0.04	0.79	0.69–0.90	0.79±0.04	0.80	0.70–0.90	0.79±0.04	0.79	0.69–0.89
WHtR	0.48±0.04	0.48	0.41–0.59	0.48±0.04	0.47	0.41–0.57	0.49±0.04	0.49	0.42–0.59

BMI – Body Mass Index; WHR – Waist-to-Hip Ratio; WHtR – Waist-to-Height Ratio

In the pre-menarche group, the average BMI was $\overline{X}$=20.58 (±2.99) and ranged from 14.84 to 29.66 (Table 1). The comparative analysis of mean somatic indices in both groups using the Mann-Whitney U test did not return statistically significant differences. The majority of the examined pre-menarche participants had normal body weights according to the BMI scale (73.08%), while 23.08% might be classified as undernourished and one person as grade 1 overweight according to BMI. Notably, BMI outliers were found in the pre-menarche group (Table 2).

The average values of WHR and WHtR were the same in both groups: pre- and post-menarche girls; and the min-max ranges were also similar (Table 1).

Results of backward stepwise regression analysis for the post-menarche group.

In the backward stepwise regression analysis, the following characteristics remained statistically significant throughout: body height (B-v), body water content (%) and body fat content (%). The following parameters were the first to be eliminated in the initial stages (steps) of the equation: WHR, WHtR and muscle mass content (%). At that stage, R^2 reached a higher level (adjusted R^2=0.397) than the final result, which may indicate that the remaining variables in the equation made for the optimal synergistic arrangement. The equation was solved following the elimination of body height, which was found to be statistically significant from the onset. The final R^2 (adjusted) amounted to 0.33 (Table 3). This means that the characteristics taken into account explain 33% of the variation in age at menarche.

Discussion

Studies show that there exists a relationship between BMI and age at menarche. Post-menarche women are found to have higher BMI scores than women prior to the onset of menstruation.[31,32] The results presented herein confirm this proposal. The girls who had started menstruating had higher body weight and slightly higher BMI scores. It may be concluded that overweight is more prevalent in post-menarche girls than those prior to the onset of menstruation. It should be noted, however, that both groups under analysis included girls with a high BMI, though there were more of them in the post-menarche group. Being overweight does not initiate menarche, but rather the onset of menstruation initiates fat accumulation.[33] The difference between the average BMI scores in the pre-menarche and post-menarche groups was found to be statistically significant (in the Mann-Whitney U test), but it was most likely due to the difference in calendar age and, consequently, in the overall biological development. At the same time, there were no significant differences in WHR or WHtR, which may point to similar fat distribution in girls before and after menarche. Interestingly, in both groups the distance between the minimum and maximum values of the observed characteristics was relatively large (and similar).

The comparative analysis of the average values of the analysed characteristics in the pre-menarche vs. post-menarche groups using the Mann-Whitney U test showed statistically significant differences in body water and muscle percentages. Yet, the same characteristics in the backward stepwise regression analysis for the post-menarche group N=71 did not confirm their leading role. Muscle mass percentage was one of the first to be eliminated out of the equation as statistically insignificant. Body water content remained statistically significant until the last step of the equation, and so did body fat content. Regression analysis showed that the characteristics taken into account explained 34% of the variation in age at menarche. The final result could be improved up to as much as 70–80% by excluding several characteristics (variables), but that would amount to manipulating the biological conditions in which the research was conducted. Body fat percentage in the comparative analysis of the post-menarche group vs. the pre-menarche group using the Mann-Whitney U test did not demonstrate statistically significant differences. This may indicate that age

TABLE 3
RESULTS OF THE BACKWARD STEPWISE MULTIPLE REGRESSION ANALYSIS FOR THE DEPENDENT VARIABLE: AGE AT MENARCHE (N=71)

Stepwise	WHR	WHtR	%muscle	Body weight	BMI	(B-v)	%water	%fat	F	Adjusted R^2
0	0.095	–0.22	–0.13	2.89	–2.7	–1.7*	–1.2*	–0.90*	6.531	0.388
1		–0.11	–0.13	2.92	–2.8	–1.7*	–1.1*	–0.91*	7.464	0.393
2			–0.12	3.02*	–2.9*	–1.7*	–1.2*	–0.93*	8.704	0.398
3				2.67	–2.6	–1.5*	–1.3*	–0.96*	10.214	0.397
4					–0.21	–0.23*	–1.3*	–0.95*	11.519	0.374
5						–0.20*	–1.1*	–0.87*	14.271	0.363
6							–1.0*	–0.79*	18.534	0.334

*p<0.05; (B-v) – *basis vertex*, body height; BMI – Body Mass Index; WHR – Waist-to-Hip Ratio; WHtR – Waist-to-Height Ratio

at menarche is independent of body fat percentage. Higher BMI values in the post-menarche group were a resultant of body heights and weights, which were due to a significant difference in calendar age rather than poor nutritional status. This is confirmed by WHR and WHtR averages for the two groups under analysis. The participant with the highest body weight was actually found in the pre-menarche group.

It is not easy to select comparative material on black girls inhabiting their native environments. Differences in research methodologies and approaches to determining body fat, muscle and water contents constitute significant obstacles. It would seem that studies from the neighbouring countries would be the most appropriate for comparison in terms of the environment and socio-demographic status, but in reality the above assumption is not quite borne out. Africa is one of the most economically and socially diverse regions of the world. These environmental differences affect morphological characteristics of its inhabitants, even those belonging to the same tribes and linguistic groups. Moreover, not all authors who analyse age at menarche take into account anthropometric data. On the other hand, however, it should be noted that the present analysis revealed age at menarche to be dependent on the same factors as those considered in studies from the developed and highly developed countries, using the same methods and criteria[34].

Some publications suggest that menarche occurs earlier in the Mediterranean region due to its favourable climate. Menarche appears later in northern latitudes due to the loss of body temperature and in southern latitudes due to slower metabolism[35]. Tybor et al[36]. noted a significant difference in the distribution of fatty tissue before menarche and after the onset of menstruation among white and black girls. Across all the age groups included in the comparison the differences were most pronounced for black girls.

A study by Leenstra et al.[37] conducted in rural western Kenya found that the average age at menarche was 15.1, higher than that of the girls from Tanzania in the present study. Authors of that study did not identify groups according to socio-demographic or socio-economic factors. Interestingly, a considerable percentage of the participating girls under the age of 15 had not reached normal body weight according to BMI scoring.

In a study by Mwakagile et al.[38] on the sexual behaviour among youths from Dar es Salaam, age at menarche was 14.9 years (±1.5) and was higher than the present results. The list of ages at menarche in Africa compiled by Padez[21] demonstrates that the present results are typical of similar communities from other countries of the continent. Belachew et al.[22] demonstrated that age at menarche is delayed in regions recognised as unstable due to chronic food shortages.

It is difficult to conclude unambiguously whether African studies on the key mechanisms contributing to the onset of menstruation are comparable to the studies from highly developed countries. It seems that Africa with its environmental conditioning has its own unique rules. In the same way, the onset of the menstruation is not necessarily dependent on reaching a »critical« body weight or fat content threshold. It is more of an indicator of the degree of biological development.

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REFERENCES

1. FRISCH RE, REVELLE R, Science, 169 (1970) 397. DOI: 10.1126/169.3943.397. — 2. WRONKA I, Anthropol Anz 68 (2010) 43. — 3. KIRCHENGAST S, BAUER M, Coll Antropol 31 (2007) 419. — 4. ORDEN AB, VERICAT A, APEZTEGUIA MC, Anthropol Anz 68 (2011) 309. — 5. BUYKEN AE, KARAOLIS-DUNCKERT N, REMER T, Am J Clin Nutr, 89 (2009) 221. DOI: 10.3945/2008.26733 — 6. BRALIC I, TAHIROVIC H, MATANIC D, VRDOLJAK O, STOJANOVIC-SPEHAR S, KOVACIC V, BLAZEKOVIC-MILAKOVIC S, J Pediatr Endocrinol Metab 25 (2012) 57. — 7. SHRESTHA A, OLSEN J, RAMLAU-HANSEN CH, BECH BH, NOHR EA, Fertil Steril 95 (2011) 2732. DOI: 10.1016/j.fertnstert.2011.02.020. — 8. OH CM, OH IH, CHOI KS, CHOE BK, YOON TY, CHOI JM, J Prev Med Public Health, 45(4) (2012) 227. DOI: 10.3961/jpmph.2012.45.4.227. — 9. FREEDMAN DS, KHAN LK, SERDULA MK, DIETZ WH, SRINIVASAN SR, BERENSON GS, Bogalusa heart, BMC Pediatr, 3 (2003) 3. — 10. ANDERSON SE, DALLAL GE, Must A, Pediatrics, 111 (2003) 844. DOI: 10.1542/111.4.844 — 11. HARRIS MN, PRIOR JC, KOEHOOM M, J Adolesc Health, 43 (2008) 548. DOI: 10.1016/2008.07.017. — 12. ONG KK, AHMED ML, DUNGER DB, Mol Cell Endocrinol, 254–255 (2006) 8. DOI: 10.1016/2006.04.018. — 13. PARENT AS, TEILMANN G, JUUL A, SKAKKEBAEK NE, TOPPARI J, BOURGUIGNON JP, Endocr Rev, 24 (2003) 668. DOI: 10.1210/2002-0019. — 14. RIGON F, BIANCHIN L, BERNASCONI S, BONA G, BOZZOLA M, BUZI F, CICOGNANI A, DE SANCTIS C, DE SANCTIS V, RADETTI G, TATÒ L, TONINI G, PERISSINOTTO E, J Adolesc Health, 46 (2010) 238. DOI: 10.1016/2009.07.009. — 15. PAPADIMITRIOU A, FYTANIDIS G, DOUROS K, BAKOULA CH, NICOLAIDOU P, FRETZAYAS A, Acta Paediatr, 97 (2008) 812. DOI: 10.1111/1651-2227.2008.00806.x. — 16. ATAY Z, TURAN S, GURAN T, FURMAN A, BEREKET A, Pediatrics, 128 (2011) e40. DOI: 10.1542/2010-2267. — 17. LOESCH DZ, HUGGINS R, ROGUCKA E, HOANG NH, HOPPER JL, Ann Hum Biol, 22 (1995) 479. DOI: 10.1080/03014469500004152. — 18. DVORNYK V, WAQAR-UL-HAQ, Hum Reprod Update, 18 (2012) 198. DOI: 10.1093/dmr050. — 19. MALINA RM, KACZMARZYK PT, BONCI CM, RYAN RC, WELLENS RE, Med Sc Sports Exerc, 29 (1997) 99. DOI: 10.1097/00005768-199701000-00014. — 20. APRAIZ AG, Am J Hum Biol, 11 (1999) 779. DOI: 10.1002/(SICI)1520-6300(199911/12)11::AID-AJHB8%3E3.0.CO;2–7. — 21. PADEZ C, Ann Hum Biol, 30 (2003) 487. DOI: 10.1080/0301446031000111401. — 22. BELACHEW T, HADLEY C, LINDSTROM D, GETACHEW Y, DUCHATEAU L, KOLSTEREN P, Reprod Biol Endocrinol, 9 (2011):125 doi: 10.1186/1477-7827-9-125. — 23. TAHIROVIC HF, Eur J Pediatr, 157 (1998) 978. — 24. BRAITHWAITE D, MOORE DH, LUSTIG RH, EPEL ES, ONG KK, REHKOPF DH, WANG MC, MILLER SM, HIATT RA, Cancer Causes Control, 20 (2009) 713. DOI: 10.1007/s10552-008-9284-9. — 25. DANUBIO ME, SANNA E, J Anthropol Sci, 86 (2008) 91. — 26. BAU AM, ERNERT A, SCHENK L, WIEGAND S, MARTUS P, GRÜTERS A, KRUDE H, Eur J Endocrinol, 160 (2009) 107. DOI: 10.1530/08-0594. — 27. MARTIN R, SALLER K, Lehrbuch der Anthropologie in Systematischer Darstellung (Gustav Fischer Verlag Stuttgar, Stuttgart 1958). — 28. Physical status: the Use and Interpretation of Anthropometry. Report of a WHO expert committee.

WHO Tech Rep Ser Geneva 854 (1995) 1-452. — 29. ASHWELL M, GUNN P, GIBSON S, Obes Rev, 13(3) (2012) 275. DOI: 10.1111/j.1467-789X.2011.00952.x. — 30. STATSOFT, Inc STATISTICA (data analysis software system), version 10 (2011) www.statsoft.com. — 31. HIMES JH, PARK K, STYNE D, J Pediatr, 155 (2009) 393. DOI: 10.1016/2009.03.036. — 32. CHO GJ, PARK HT, SHIN JH, HUR JY, KIM YT, KIM SH, LEE KW, KIM T, Eur J Pediatr, 169 (2010) 89. DOI: 10.1007/s00431-009-0993-1. — 33. WANG W, ZHAO L-J, LIU Y-Z, RECKER RR, DENG H-W, Int J Obes, 30 (2006) 1595. DOI: 10.1038/0803322. — 34. RĘBACZ E, Coll Antropol, 33(1) (2009) 23. — 35. BANDINI LG, MUST A, SPADANO JL, DIETZ WH, Am J Clin Nutr, 76 (2002) 1040. — 36. TYBOR DJ, LICHTENSTEIN AH, DALLAL GE, DANIELS SR, Must A, BMC Pediatr, 21,10:2 (2010). DOI: 10.1186/1471-2431-10-2. — 37. LEENSTRA T, PETERSEN LT, KARIUKI SK, OLOO AJ, KAGER PA, TER KUILE FO, Eur J Clin Nutr, 59 (2005) 41. DOI: 10.1038/1602031. — 38. MWAKAGILE D, AMARI E, MAKWAYA C, MBWANA J, BIBERFELD G, MHALU F, SANDASTRÖM E, Sex Transm Infect, 77 (2001) 255. DOI: 10.1136/sti.77.4.255.

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OVISNOST IZMEĐU DOBI MENARHE, SASTAVA TIJELA I ODABRANIH SOMATSKIH INDEKSA

S A Ž E T A K

Cilj ovog rada je analizirati dob menarhe kod tanzanijskih djevojaka u korelaciji sa sastavom tijela i odabranih tjelesnih indeksa. U istraživanju je sudjelovalo 97 djevojaka (71 poslije menarhe i 26 prije menarhe). Mjerenja su izvršena za tjelesnu visinu, tjelesnu masu, struk i opseg struka. Sastav tijela je analiziran za postotke tjelesne vode, masnoće i mišića. Nutritivni status i distribucija tjelesne masnoće djevojaka su određeni pomoću sljedećih somatskih indeksa: BMI, WHR (Omjer struka i kukova) i WHtR (omjer struka i visine). Za skupine poslije menarhe (N = 71) provedena je postupno nazadna višestruka regresijska analiza. Prosječna dob menarhe izračunata je primjenom metode opoziva za N = 71 je = 14,29 godina, kalendarska dob = 15,92 godina. Više od polovice (57,69%) djevojaka u skupini prije menarhe nije dostigao tjelesnu težinu od 48kg, dok ih je u skupini poslije menarhe bilo 32,39%. Čak 97,18% od postmenarhnih djevojčica imalo je tjelesni postotak masti od 22%, u odnosu na 88,46% iz skupine prije menarhe. U pogledu BMI-a, 74,65% postmenarhnih djevojaka je imalo zdravu težinu, u usporedbi sa 73,08% iz skupine prije menarhe. Nije bilo značajne razlike kod WHR ili WHtR, koji mogu ukazati sličnu raspodjelu masti u djevojčice prije i nakon menarhe. Analiza je pokazala da početak menstruacije nije strogo vezan s dostizanjem kritične točke u tjelesnoj težini i sastavom tijela.