

Menarche and Menstruation in Various Ethnic Groups in Israel

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SUMMARY

Sexual development may be influenced by geographic factors (temperature, humidity, altitude, light), socioeconomic factors (nutrition, public health, family size), and genetic factors (population, familial heredity). Most of them are largely interrelated and difficult to define.

An anamnestic study has been carried out in Israel on Ashkenazi, non-Ashkenazi, and Arab women aged 19 to 60. The age of menarche appeared to be significantly different for Ashkenazi vs. non-Ashkenazi, while no significant difference was found between Arabs and either of the two Jewish groups. Highly significant differences were found for the length of the menstrual cycle, although this finding should be considered with caution. No significant relationship was found between age of menarche and length of the menstrual cycle.

From investigations made over the past few decades in different countries and under different conditions it has become clear that data on human sexual development in one population are rarely applicable to another. To define the relationships between sexual development and genetic or environmental factors, the most meaningful comparisons are those made on people maturing at approximately the same time and living under similar conditions (Zaccharias and Wurtman, 1969).

Factors that may influence sexual development include geographic factors (temperature, humidity, altitude, light), socio-economic factors (nutrition, public health, family size, living conditions), and genetic factors (race or ethnic group, familial heredity). Many of these factors are interrelated, and their separate effects on sexual variables cannot be analysed precisely.

Generally speaking, there are two ways in which the age of menarche can be investigated in large populations: either by asking women at which age they began menstruating (anamnestic information), or by asking young girls whether they have already begun (Editorial, B.M.J., 1960). The second method is the more reliable as it is less susceptible to incorrect recollection. The most accurate method of all is obviously the prospective recording of the start of menstruation as it occurs, in a cohort from the age of about 10 years.

It was previously widely believed that sexual development occurs at an earlier age in the tropics than in temperate zones, but there is now almost unanimous agree-

ment that climate alone has little or no effect on the age of menarche (Zaccharias and Wurtman, 1969). With regard to socio-economic factors, it is generally accepted that a more elevated socio-economic level leads to an acceleration of physical growth and sexual maturation. This phenomenon, together with environmental effects, outweighs any possible effects of race. Nutrition is an important component of the socio-economic level in this context, since it has been shown that good nutrition has an accelerating effect on puberty, while food shortages, or an inadequate diet have a delaying effect (Zaccharias and Wurtman, 1969).

Girls who menstruate earlier tend to have a shorter, pyknic stature, while those who menstruate later are generally taller and leptosomic (Daly, 1966). Body size is basically genetic, but is obviously influenced by nutrition. It is not clear, however, whether it is the basic genetic tendency to shorter stature which results in earlier menstruation, or whether early menarche is the primary factor which leads to earlier completion of physical growth and maturation and hence to a shorter adult stature.

With regard to other studies conducted in Israel (see Tab. I), it has generally been found that girls born in Europe or America have an earlier age of menarche

Tab. I. Results from selected Israeli studies

| Ethnic origin (country of birth) | Mean age of menarche | Author |
|-------------------------------------|-------------------------|--|
| Europe and America | 13.43 | Shiloh, 1960 (Jerusalem 1958) |
| Asia and Africa | 13.94 | |
| Europe and America | 13.14 | Shiloh, 1965 (Tel Aviv 1960) |
| Asia and Africa | 13.35 | |
| Israel | 13.05 | |
| Ashkenazi | 13.1 | Bergman, 1961 (Kfar Saba & Holon 1961) |
| Sephardi | 13.5 | |
| Oriental | 12.5 | |
| Miscellaneous ^a | 13.29 | Sohar and Rieber, 1960 |

^a No significant difference was found between the various ethnic groups, and the authors concluded that "ethnic and climatic factors do not influence the age of the menarche."

than those born in Asia and North Africa. This applies also to girls who were born in Israel but whose fathers were born in those two groups of countries respectively (it is not clear why the *father's* country of birth is usually considered, and not the *mother's*). For practical purposes, the two groups of people may be referred to as "Ashkenazi" and "non-Ashkenazi" respectively, although several different subgroupings exist, particularly with regard to the second group. In most studies, thus, a significant difference in the age of menarche has been found between girls from different ethnic origins.

However, variations in the age of menarche between girls from different socio-economic groups override the ethnic differences, and broadly-speaking, girls whose fathers are in the higher social grades (according to profession or occupation) have an earlier menarche than those whose fathers are unskilled labourers, for example, regardless of their ethnic background (Shiloh and Goldberg, 1965).

In another study it was found that out of 12-year old girls in Jerusalem schools, 47% of those who had "higher social standards" (7% Europe-born, 93% Israel-born), menstruated within 6 months on either side of age 12, while only 30% of those with "lower social standards" (1% Europe-born, 20% North African, 1% Asian and 78% Israel-born) first menstruated in that period. This difference was not statistically significant (Guggenheim et al, 1966).

Innumerable articles and books have been published on the length and variability of the human menstrual cycle, mainly with regard to its regularity and regulation for purposes of conception control by periodic abstinence. In normal, healthy, mature females, the average cycle length varies from 21 to 35 days [about 77%-78% of women, according to most studies (Brayer et al, 1969)]. The regularity of the menstrual cycle seems to be a function of age, with variability highest for women under 25 years, greatest regularity between the ages of 30-40 years [according to some studies, 30-34 years (Brayer et al, 1969), and to others, 35-39 (Chiazze et al, 1968)], and variability increasing again in older women up to the menopause. One would expect, thus, that a high percentage of young girls or older women in a sample would give a higher incidence of long cycles.

Discussion of the Results of the Present Investigation

Most of the information from which the present analysis was made was obtained from women in the delivery room, during the filling in of the Delivery Form, and some was obtained in the Gynecology Wards. All the information is therefore anamnestic, based on the memory of women whose ages ranged from about 19 up to 60 (Tab. II). They differed enormously in their socio-economic and cultural backgrounds, and this fact makes them not strictly comparable with regard to the phenomena of sexual development and physiology.

(1) The age of menarche obtained in this way can therefore not be regarded as precise, and for this reason it was considered preferable to classify the women accord-

Tab. II. Age distribution of the women in the sample investigated

| | ≤ 19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 | 45-49 | 51-60 | > 60 | Total |
|---------------------------|------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| Ashkenazi | 5 | 287 | 295 | 145 | 93 | 51 | 40 | 26 | 13 | 955 |
| Non-Ashkenazi and Arab | 30 | 227 | 275 | 191 | 118 | 54 | 22 | 12 | 2 | 931 |

ing to age groups (e.g., <11 years, 11-12 years, etc.), rather than attempt to find a mean age of menarche. The results obtained on comparing the women from different countries of birth (regardless of the age at which they arrived in Israel) and the χ^2 significance test performed on these figures led to the observations shown in Tab. III.

Tab. III. Relationship between country of origin and age of menarche

| Country of Origin | ≤ 12 years | | 13-14 years | | > 14 years | | Total |
|---|-----------------|------|-------------|------|--------------|------|-------|
| | N | % | N | % | N | % | |
| Poland | 34 | 26.9 | 68 | 53.9 | 24 | 19.0 | 126 |
| Rumania | 54 | 35.2 | 80 | 52.2 | 19 | 12.4 | 153 |
| Russia, Czechoslovakia, Hungary, Lithuania | 38 | 32.7 | 60 | 51.7 | 18 | 15.5 | 116 |
| Germany, Austria | 22 | 37.2 | 28 | 47.4 | 9 | 15.2 | 59 |
| America, South Africa | 13 | 44.8 | 14 | 48.2 | 2 | 6.8 | 29 |
| Israel | 171 | 39.1 | 221 | 50.5 | 45 | 10.2 | 437 |
| Others | 15 | 42.8 | 17 | 48.5 | 3 | 8.5 | 35 |
| Total Ashkenazi | 347 | 36.3 | 488 | 51.1 | 120 | 12.5 | 955 |
| Greece, Turkey, Bulgaria, Yugoslavia, Spain, Italy | 19 | 37.2 | 29 | 56.8 | 3 | 5.8 | 51 |
| Yemen | 53 | 21.4 | 135 | 56.1 | 54 | 22.3 | 242 |
| Iraq, Persia (Iran), Afghanistan | 79 | 30.9 | 133 | 52.1 | 43 | 16.8 | 255 |
| Morocco, Algeria, Syria, Lebanon | 35 | 29.9 | 67 | 57.2 | 15 | 12.9 | 117 |
| Egypt, Lybia, Tunisia | 11 | 23.9 | 29 | 63.0 | 6 | 13.0 | 46 |
| India, Pakistan | 13 | 50.0 | 11 | 42.3 | 2 | 7.6 | 26 |
| Israel | 29 | 24.1 | 76 | 63.3 | 15 | 12.5 | 120 |
| Total non-Ashkenazi | 239 | 27.9 | 480 | 56.1 | 138 | 16.8 | 857 |
| Arabs | 19 | 38.7 | 24 | 48.9 | 6 | 12.0 | 49 |

There was a significant difference ($\chi^2 = 14.63$; 2 *df*; $P < 0.01$) between the distribution of age of menarche for Total Ashkenazi and Total non-Ashkenazi. The higher percentage of "early menstruating" girls in the former group would probably lead to a lower mean age of menarche if this were to be calculated, and this observation agrees with other similar Israeli studies.

Of the Ashkenazi group, the highest percentage of "early menstruating" (≤ 12 y.) was in the America-South Africa group (44.8%), which also had the lowest percentage of "late menstruating" girls (> 14 y.: 6.8%), but the differences between women from different countries of origin were not significant.

Of the non-Ashkenazi Jewish group, the highest percentage of "early menstruating" girls was in the Northern Mediterranean group (Greece, Turkey, Bulgaria, Yugoslavia, Spain, Italy: 37%), which also had the lowest percentage of late menstruating girls (5.8%), but the differences were not significant. Conversely, the high-

est percentage of late menstruating girls was found in the Yemenites (22.3%).

There was no significant difference between the Arab group and either of the two Jewish groups, with regard to the age of menarche.

(2) Information on the length of the menstrual cycle is likely to be relatively more precise than the age of menarche, since it is based on a continuing phenomenon and not a one-time event which occurred several years previously. It was nevertheless considered more appropriate to state the figures in terms of range of cycle lengths (25-28 days, 29-35 days), rather than attempt to give mean cycle lengths.

There was no striking difference between women from different countries of origin within the two big groups as regards the length of the menstrual cycle (Tab. IV).

Tab. IV. Relationship between country of origin and length of menstrual cycle

| Country of origin | < 25 days | | 25-28 days | | 29-35 days | | > 35 days | | Total |
|---|-----------|-----|------------|------|------------|------|-----------|------|-------|
| | N | % | N | % | N | % | N | % | |
| Poland | 3 | 2.3 | 47 | 37.2 | 56 | 44.4 | 20 | 15.8 | 126 |
| Rumania | 5 | 3.2 | 61 | 40.1 | 60 | 39.4 | 26 | 17.1 | 152 |
| Russia, Czechoslovakia, Hungary, Lithuania | 5 | 4.3 | 51 | 43.9 | 47 | 40.5 | 13 | 11.2 | 116 |
| Germany, Austria | 1 | 1.6 | 32 | 54.2 | 22 | 37.2 | 4 | 6.7 | 59 |
| America, South Africa | | | 14 | 48.3 | 12 | 41.3 | 3 | 10.3 | 29 |
| Israel | 8 | 1.8 | 211 | 48.2 | 165 | 37.8 | 53 | 12.1 | 437 |
| Others | 1 | 2.8 | 18 | 51.4 | 14 | 4.0 | 2 | 5.7 | 32 |
| Total Ashkenazi | 23 | 2.4 | 434 | 45.3 | 377 | 39.4 | 121 | 12.6 | 955 |
| Greece, Turkey, Bulgaria, Yugoslavia, Spain, Italy | 1 | 1.9 | 27 | 52.9 | 17 | 33.3 | 6 | 11.7 | 51 |
| Yemen | 5 | 2.1 | 129 | 53.5 | 89 | 36.9 | 18 | 7.4 | 241 |
| Iraq, Iran, Afghanistan | 6 | 2.3 | 140 | 55.3 | 88 | 34.7 | 19 | 7.5 | 253 |
| Morocco, Algeria, Syria, Lebanon | 1 | — | 65 | 55.5 | 41 | 35.8 | 10 | 8.5 | 117 |
| Egypt, Lybia, Tunisia | — | — | 28 | 60.8 | 17 | 36.9 | 1 | 2.1 | 46 |
| India, Pakistan | — | — | 16 | 61.5 | 10 | 38.4 | — | — | 26 |
| Israel | 1 | — | 70 | 58.3 | 43 | 35.8 | 6 | 5.0 | 120 |
| Total non-Ashkenazi | 14 | 1.6 | 475 | 55.6 | 305 | 35.7 | 60 | 7.1 | 854 |
| Arabs | — | — | 30 | 61.2 | 19 | 38.7 | — | — | 49 |

However, a highly significant difference ($\chi^2 = 29.66$; 2 *df*; $P \leq 0.001$) was found on comparing these two big groups. In the Ashkenazi group, there was a much wider range of cycle lengths (higher percentages of women with cycle lengths < 25 days and > 35 days) than in the non-Ashkenazi group, while in this second group, more than 50% of the women had cycle lengths of 25-28 days.

Caution should be taken in attaching too great a significance to this apparent

difference. It should be taken into account, for instance, that a certain amount of bias may be introduced into the figure by the formulation of the question. The figure "28" is recognised widely as "normal", and an inquirer who is trying to prod a quick answer out of a woman about to enter the delivery room might be inclined to suggest this figure. Because of the high proportion of women from lower social classes in the second group, it might be expected that the figures may be thus biased and less accurate than those for the first group, who are more likely to give an accurate figure.

(3) The examination of the possible relationship between the age of menarche and the length of the menstrual cycle during the reproductive period showed that among the Ashkenazi women there was no significant relationship — i.e., there was a random distribution of "early menstruators" and "late menstruators" among the women with short cycles and long cycles.

For the non-Ashkenazi group, on the other hand, there was a significant relationship between the age of menarche and the length of the menstrual cycle, with the early menstruating girls tending to have shorter cycles and those with a higher age of menarche tending to have longer cycles ($\chi^2 = 15.07$; 6 *df*; $0.01 < P < 0.05$).

From the age distribution of the women in this sample (Tab. II) it can be seen that the large majority of the women (76% of the Ashkenazi and 74% of the non-Ashkenazi women) were between the ages of 20 and 34, i.e., at the age where the cycles are more or less regular and can be stated fairly accurately (within the limitations of the method of ascertainment). Thus the figures for the total sample are relatively unbiased by the presence of appreciable numbers of younger or older women who might raise the percentage of long cycles in the total sample. The relatively higher percentage of women above the age of 45 in the first group, however, (8% as against 4% in the non-Ashkenazi group), may have been responsible for the relatively higher incidence of shorter and longer cycles observed (Tab. V).

Tab. V. Relationship between length of menstrual cycle and age at menarche

| | < 11 | | 11-12 | | 13-14 | | > 14 | | Total | |
|-------|------|-----|-------|------|-------|------|------|------|-------|---|
| | N | % | N | % | N | % | N | % | | |
| < 25 | — | — | 7 | 3.4 | 14 | 60.9 | 2 | 8.7 | 23 | Ashkenazi |
| 25-28 | 6 | 1.4 | 149 | 34.3 | 228 | 52.5 | 51 | 11.7 | 434 | $\chi^2 = 4.54$; 6 <i>df</i> ; ns |
| 29-35 | 1 | 0.3 | 146 | 38.7 | 182 | 48.3 | 48 | 12.7 | 377 | |
| > 35 | 1 | 0.8 | 37 | 30.6 | 64 | 52.9 | 19 | 15.7 | 121 | |
| Total | 8 | 0.8 | 339 | 35.5 | 488 | 51.1 | 120 | 12.6 | 955 | |
| < 25 | — | — | 4 | 25.0 | 8 | 50.0 | 4 | 25.0 | 16 | non-Ashkenazi |
| 25-28 | 2 | 0.4 | 164 | 31.7 | 282 | 54.5 | 69 | 13.3 | 517 | $\chi^2 = 15.07$; 6 <i>df</i> ; $0.01 < P < 0.05$ |
| 29-35 | 1 | 0.3 | 80 | 24.2 | 194 | 58.8 | 55 | 16.7 | 330 | |
| > 35 | 1 | 0.2 | 11 | 17.5 | 34 | 54.0 | 17 | 27.0 | 63 | |
| Total | 4 | 0.4 | 259 | 28.0 | 518 | 55.9 | 145 | 15.7 | 926 | |

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RIASSUNTO

Lo sviluppo sessuale può essere influenzato da fattori geografici (temperatura, umidità, altitudine, illuminazione), da fattori socio-economici (nutrizione, condizioni sanitarie, famiglia media), e da fattori genetici (eredità di popolazione e familiare). La maggior parte di questi fattori sono ampiamente collegati fra loro e difficili da isolare.

Uno studio anamnestico è stato condotto in Israele su donne Ashkenazi, non-Ashkenazi ed arabe di 19-60 anni. L'età del menarca è risultata significativamente diversa fra Ashkenazi e non-Ashkenazi, mentre fra le donne arabe e quelle dell'uno o dell'altro dei due gruppi ebrei non è stata riscontrata alcuna differenza significativa. Differenze molto significative sono state riscontrate per la durata del ciclo mestruale, ma questa osservazione dovrebbe essere considerata con cautela. Tra età del menarca e durata del ciclo mestruale non è stata riscontrata alcuna relazione significativa.

RÉSUMÉ

Le développement sexuel peut être influencé par des facteurs géographiques (température, humidité, altitude, lumière), par des facteurs socio-économiques (nutrition, santé publique, famille moyenne), et par des facteurs génétiques (hérédité de population et familiale). La plupart de ces facteurs sont largement interreliés et donc difficiles à identifier.

Une étude anamnétique a été conduite en Israël sur des femmes Ashkenazi, non-Ashkenazi et arabes âgées de 19-60 ans. L'âge du ménarche est significativement différente entre Ashkenazi et non-Ashkenazi, tandis que aucune différence significative ne fut remarquée entre arabes et l'un ou l'autre des deux groupes juifs. Des différences très significatives furent remarquées pour la durée du cycle menstruel, mais cette observation devrait être considérée avec prudence. Aucune relation significative ne fut remarquée entre âge du ménarche et durée du cycle menstruel.

ZUSAMMENFASSUNG

Mehrere Faktoren können die Geschlechtsentwicklung beeinflussen: geographische Faktoren wie Temperatur, Feuchtigkeit, Höhenlage, Lichtverhältnisse; sozialökonomische Faktoren wie Ernährung, hygienische Verhältnisse, Durchschnittskinderzahl und Erbfaktoren, d.h. Bevölkerungs- und Familienerblichkeit.

Bei aschkenasischen, nicht-aschkenasischen und arabischen Frauen im Alter von 19-60 J. wurden die Anamnesen aufgenommen. Dabei erschien das Menarchealter bei aschkenasischen und nichtaschkenasischen Frauen recht verschieden, während zwischen diesen beiden jüdischen Gruppen und den Araberinnen kein wesentlicher Altersunterschied zu bemerken war. Erhebliche Unterschiede zeigten sich hingegen in Bezug auf die Dauer des Zyklus, doch ist diese Beobachtung nur mit Vorsicht zu betrachten. Zwischen Menarchealter und Zyklusdauer liess sich keine bedeutende Beziehung feststellen.

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