REFERENCE VALUES OF BODY MASS AT BIRTH AMONG NATIVE NORTHERN POPULATION OF RUSSIA

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ABSTRACT

Infants with body mass at birth deviating from the mean values exhibit higher level of mortality. The absence of the expressed phenotype deviations refers to the preservation and heredity of the most adopted genotypes (reference values). The newborns out of the adaptive norm are morbidity-prone. The reference value for body mass at birth was studied in the indegenous populations of the Kola Peninsula, Siberia, Far East and the Urals. By our data the Arctic Saami and the Far East Nanais show the reference values more distinct from other. Lasting (many-centuries-long) adaptation to specific environmental conditions leads to development of a special phenotype complex. The Saami and Nanais are the most representative populations of the arctic and the monsoon climate zones. Accordingly, the parameters of reference values of their newborns are significantly different from the characteristics of the infants of the moderate climate zone. *(Int J Circumpolar Health 2002; 61: 245-250)*

Keywords: Newborns; Body mass at birth; Infant health, Northern indigenous populations, Adaptation

Many research works confirm the presence of stabilizing selection by body mass among newborns and infants in their first months of life [4, 9]. Absence of evident phenotype deviations secures preservation of the most well adapted genotypes (reference values). This reference value is passed over from generation to generation [7]. In the course of natural selection the genes decreasing nonspecific stability of the developing organism get rejected as defective. Thus the variability of a whole complex of correlated anthropometric signs is controlled [2]. Newborns whose weight and lenght go beyond the reference values are more often in danger of developing various deseases as compared with those whose characteristics are closer to the mean value typical for their population.

The aim of the study is to show that the medical and biological peculiarities of representatives of a concrete

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ethnic group should be taken into consideration when finding out the boundaries of reference values. Therefore we studied the condition of newborns belonging to various ethnic and territorial groups. This kind of task is quite urgent for Russia as a polyethnic state of a vast territory with variable climate and geography.

SUBJECTS AND METHODS

The studied populations represent indigenous inhabitants of the northern regions of Russia [5]. Anthropometric characteristics of newborns were taken from medical documents (birth histories).

Arctic and Sub-Arctic inhabitants are the indigenous populations of Russian European North (the Kola Saami) and Western Siberia (the Mansi and Khanty). The Mongolian group of sharp-continental climate are the Buryats of the Trans-Baikal region. The Far East indigenous group is the Nanay people of the Amur River. The Permian Finns of the Urals region (the Komi-Permyaks and Udmurtians) represent the population of the moderate continental climate zone. The reference groups are the Russians of Western Siberia (our data) and Moscow [6]. Geographical distribution of researched groups is shown on Fig. 1.

The samples include data from birth histories (both

Fig. 1. Geographical distribution of studied groups.

Table I. Anthropometric characteristics of newborns in different ethnic groups of the Russian North

Sex	Ethnic group	N	Body mass g		Body length mm		Head circumference mm		Chest circumference mm	
			M	SD	M	SD	M	SD	M	SD
Boys	Saami	90	3077.1	582.5	510.2	34.5	343.7	20.6	336.7	20.8
	Khanty	37	3370.3	481.5	522.8	26.1	349.7	21.2	343.1	22.5
	Mansi	26	3397.7	513.5	543.5	23.8	354.8	14.5	347.1	16.9
	Nanais	29	3348.3	520.7	526.2	22.5	352.4	14.5	347.9	18.2
	K-permyaks	310	3398.1	515.6	511.9	23.4	352.6	16.0	342.2	18.6
	Buryats	87	3572.4	401.5	512.6	19.6	344.8	16.8	333.4	14.8
	Russians	113	3629.5	545.4	531.4	26.6	346.2	13.4	341.6	12.8
Girls	Saami	70	3020.7	510.4	509.0	30.7	339.0	18.0	331.7	22.5
	Khanty	41	3286.3	416.1	515.1	31.1	344.9	12.5	334.4	16.5
	Mansi	27	3341.6	450.8	530.4	27.2	347.2	10.8	346.4	18.6
	Nanais	23	3122.0	428.2	521.0	19.7	347.5	10.7	337.9	18.7
	K-permyaks	325	3301.0	438.8	505.4	19.0	347.4	14.3	342.2	18.6
	Buryats	57	3418.6	378.2	505.6	19.1	342.3	12.8	331.3	13.8
	Russians	116	3422.0	440.3	519.9	22.4	342.9	12.3	339.6	14.0

normal and pathological labors) of all newborns: healthy, sick, born prematurely and on time. The only data excluded from researched material concerned cases of twins. Size of sample is given in the Table I depicting the result of research.

All deviations in condition of newborns (illnesses, stigmas, innate deformities, cases of mortinatality and death within the first day after birth) were evaluated and scored. The mean value of morbidity score for a particular population was calculated. According to the earlier research [1] the zone of reference values of newborns' body mass was defined on healthy infants' characteristics only. The boundaries of reference values were set as 0.5 SD from the mean value.

RESULTS AND DISCUSSION

Population characteristics of the body sizes of newborns from the Russian North are represented in Table I. The data about ethnically Russian newborns from Western Siberia is given as reference material.

The smallest weight and length at birth (in the average 3052.4 g and 509.7 mm accordingly) were found among the Saami. They are even smaller significantly than the Nanay newborns who hold the second position among the researched groups as far as weight and length are considered (weight: $p<0.05$, and body length: $p<0.01$).

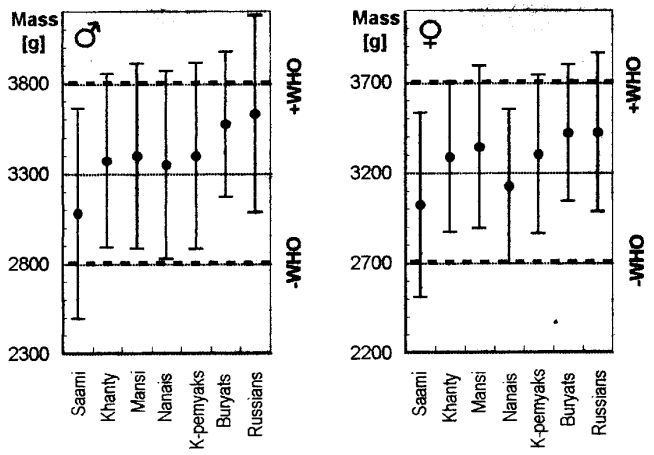

Fig. 2. Body mass at birth in different ethnic groups, in comparison with the WHO standards.

By recommendations of the World Health Organization, mean values of body mass for boys and girls should be accordingly 3300 and 3200 g with standard deviation equal 500 g [3]. Mean values of newborns in all researched groups (except the Saami) are even a little bigger than those recommended by the WHO (Fig. 2). In all researched groups without exclusion the mean values of body mass at birth are within standard deviation for boys and girls recommended by the WHO.

Length and weight at birth among newborns from East and West Siberia exceed not only the mean values suggested by the WHO, but also mean total body sizes of American newborns of corresponding race groups [8]. Length and weight of Russian infants of West Siberia is only a little bigger than corresponding measures of European Americans in California. When newborns representing indigenous populations of West Siberia (the Khanty and Mansi) are significantly ($p<0.001$) longer than American newborns of the Chinese origin. As for the Buryats, both their length and weight are significantly bigger ($p<0.001$) than the same measures of the Chinese infants born in the United States.

We attribute these differences to the more "Northern" origin of the researched groups. The variability of length and body mass among representatives of the compared populations is well explained by the "Bergman rule" (high-latitude populations show increase in all body measurements).

The dependence between the child's viability to diseases and his body mass at birth is illustrated by our data of the newborn Permian Finns (the Komi-permyaks and Ud-

murts). Mean values of body mass for both populations are quite close (3.349 and 3.344 kg accordingly; difference is insignificant). Representatives of both related ethnic groups live in the same climatic and geographical zone, in practically indentical ecological conditions of the basin of the Upper Kama river. Thus it was possible to pool the data describing the Udmurts and Komi-permyaks together.

Fig. 3 shows the diagram of morbidity (expressed in standard units) among newborns with different body mass. The average level of morbidity is 5.45 units for our sample. Mean value of body mass for this sample is 3.334 kg (SD=0.482 kg, n=657). It is clear that for infants with body mass at birth between 3.10 and 4.35 kg morbidity appears to be below the average, whereas in the groups with body mass lower and higher than the above-mentioned range, morbidity in the first days of life is much higher.

For the studied sample of Permian Finns the mean value of body mass among healthy, born on time infants (433 infants) is 3.355 kg (SD=0.452). The zone of the reference values of body mass at birth (M±0.5SD) lies within the interval between 3.128 and 3.582 kg. About 43 % of healthy newborns appear to fit into the range of adaptive body mass norm, as for the extreme phenotype zones (both small and big) we find there 29% and 28% accordingly.

Mean body mass among healthy newborn Permian Finns is 49 g less than body mass of healthy Moscovites [6]. This difference is significant ($p<0.05$). The zone of reference values of body mass among infants of the Kama-Ural region is shifted accordingly.

Similar procedures were carried out while analyzing the data characterizing other populations. The most pronounced difference from reference group of Moscow newborns in reference values of body mass [6] was found in the samples of indigenous Arctic (the Saami) and the Far East inhabitants (the Nanais - Fig. 4).

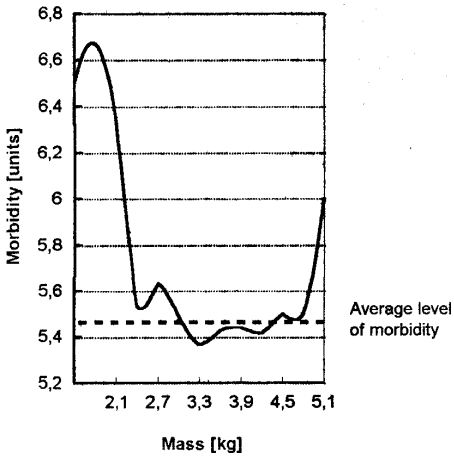

Fig. 3. Morbidity of Permian Finn newborns, related to their body mass at birth.

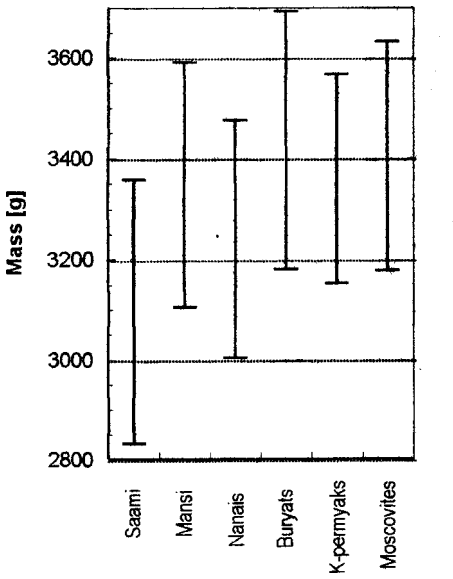

Fig. 4. Refrence values of body mass at birth for different ethnic groups.

CONCLUSION

Our data shows that for newborns of various ethnic groups of Arctic, Sub-Arctic and other specific areas the international (WHO) and even national standards are not always valid. The peculiarities of reference values among representatives of the researched populations prove the

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necessity of setting regional fitness standards for newborns in view of needs of practical medical care.

We explain the observed interethnic differences in body measures by ecological reasons. Lasting (many-centuries-long) adaptation to specific environmental conditions leads to development of a special phenotype complex. The Saami and Nanais are the most representative populations of the arctic and monsoon climate zones. Accordingly, the range of reference values of their newborns are significantly different from the characteristics of the infants of the moderate climate zone.

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