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**Assessment of Anthropometric Data of Children Died at Perinatal Period**

**Background.** Despite the decrease in fetoinfantile losses, the levels of perinatal mortality and stillbirth remain quite high. One of the medical criteria for viability is the anthropometric indicators of the child, therefore, their relevant medical and statistical assessment may allow us to establish potential opportunities for reducing the loss of viable children at perinatal period. **Objective. The aim of the study is to** assess anthropometric data of children died at perinatal period. **Methods.** We have analyzed 277 cases of children deaths at ante- and intranatal periods and 197 cases of newborns deaths during first 7 days of life. Assessment of anthropometric data of children died at perinatal period was presented via the method of sigmal deviations and the centile method. **Results.** Anthropometric data of premature infants died at perinatal period in 90–94% of cases corresponded to the physical development for children of this gestational age. Anthropometric data of full-term children died during the first 168 hours of life, in 70.0% of cases, corresponded to 3–6 corridors of physical development (P10–P90), in 20.0% of cases —7–8 corridors. 58.3% of full-term children died at perinatal period have harmonious development which significantly exceeds the proportion of children with sharply disharmonious development (19.5%) and with disharmonious development (22.2%). 79.0% of all neonatal deaths occur in the first 72 hours of life (for the early neonatal period), while losses on the first day account for 54.0% of all deaths in children during the first week. **Conclusion.** This study has shown that the anthropometric data of children died at perinatal period significantly corresponded to the standard indicators established for children of this gestation age.

**Keywords:** anthropometric data, stillbirth, indicators of physical development, perinatal mortality, died newborns

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**Table 1.** Assessment of anthropometric data of stillborn and died newborns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Indicators** | **Stillborn**  ***М* ± *m* (*min*–*max*)**  ***n* = 277** | | **Died newborns**  ***М* ± *m* (*min*–*max*)**  ***n* = 197** | |
| **< 28 weeks**  ***n* = 68** | **> 28 weeks**  ***n* = 209** | **< 28 weeks**  ***n* = 43** | **> 28 weeks**  ***n* = 154** |
| Body weight, g | 692,7 ± 58,60  (295–1820) | 2236,5 ± 116,00\*  (509–4300) | 794,6 ± 49,10 (400–1200) | 2659,7 ± 119\*  (790–6240) |
| Body length, cm | 30,6 ± 0,85  (22–39) | 45,2 ± 0,85\*  (22–58) | 32,2 ± 0,90  (31–56) | 47,0 ± 0,74\*  (31–56) |
| Head circumference, cm | 21,7 ± 0,55  (17–28) | 30,3 ± 0,59**\***  (14–39) | 23,4 ± 0,49  (19–27) | 32,3 ± 0,40\*  (24–43) |
| Chest circumference,  cm | 17,7 ± 0,49  (13–21) | 27,3 ± 0,76**\***  (13–35) | 20,4 ± 0,48  (16–25) | 30,2 ± 0,59**\***  (20–36) |
| Quetelet index I | 22,2 ± 1,43  (13,8–52,0) | 47,0 ± 1,80**\***  (16–69,6) | 25,5 ± 0,96  (15,81–47,39) | 58,9 ± 1,69**\***  (27,5–79,35) |

*Note. <\*> — statistically significant differences between children’s groups with the same gestational age (р˂0,05).*

**Table 2.** Assessment of body weight of stillborn and died newborns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gestational age, weeks** | **Standard indicators of body weight, g** | | | **Body weight according to study data, g** | |
| **Stillborn**  **(*n* = 130)** | **Died newborns**  **(*n* = 96)** |
| ***М* ± *σ*** | ***М* − 2*σ*** | ***М* + 2*σ*** | ***М* ± *σ*** | |
| 28 | 1124 ± 183 | 758 | 1490 | 1038,50 ± 119,07  (22) | 988,17 ± 67  (15) |
| 29 | 1381 ± 172 | 1037 | 1725 | 931,75 ± 392,72  (18) | 1363,33 ± 183  (14) |
| 30 | 1531 ± 177 | 1177 | 1885 | 1311,38 ± 602,95  (16) | 1093,33 ± 352,74  (12) |
| 31 | 1696 ± 212 | 1272 | 2120 | 1512,25 ± 791,15  (15) | 1500,00 ± 251,65  (11) |
| 32 | 1827 ± 267 | 1293 | 2361 | 1547,00 ± 359,85  (14) | 1732,00 ± 254,32  (13) |
| 33 | 2018 ± 241 | 1536 | 2500 | 1420,00 ± 296,89  (13) | 2010,00 ± 110,02  (11) |
| 34 | 2235 ± 263 | 1709 | 2761 | 2244,67 ± 364,67  (12) | 2229,86 ± 104,15  (8) |
| 35 | 2324 ± 206 | 1912 | 2736 | 2290,75 ± 281,35  (11) | 2180,00 ± 707,14  (7) |
| 36 | 2572 ± 235 | 2102 | 3042 | 2672,00 ± 740,07  (9) | 2635,00 ± 219,86  (5) |

**Table 3.** Assessment of the body length of stillborn and died newborns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gestational age, weeks** | **Standard indicators of body length, cm** | | | **Body length according to study data, cm** | |
| **Stillborn**  **(*n* = 130)** | **Died newborns**  **(*n* = 96)** |
| ***М* ± *σ*** | ***М*− 2*σ*** | ***М*+ 2*σ*** | ***М* ± σ** | |
| 28 | 35,9 ± 1,80 | 32,30 | 39,50 | 35,33 ± 1,96  (22) | 36,13 ± 6,12  (15) |
| 29 | 37,9 ± 2,00 | 33,90 | 41,90 | 37,67 ± 3,05  (18) | 37,50 ± 3,42  (14) |
| 30 | 38,9 ± 1,70 | 35,50 | 42,30 | 35,33 ± 3,38  (16) | 39,00 ± 6,31  (12) |
| 31 | 40,4 ± 1,60 | 37,20 | 43,60 | 43,00 ± 1,96  (15) | 37,75 ± 7,52  (11) |
| 32 | 41,3 ± 1,90 | 37,50 | 45,10 | 43,75 ± 1,98  (14) | 40,15 ± 5,78  (13) |
| 33 | 42,7 ± 1,80 | 39,10 | 46,30 | 44,50 ± 2,10  (13) | 42,00 ± 4,23  (11) |
| 34 | 43,6 ± 1,70 | 40,20 | 47,00 | 46,43 ± 2,24  (12) | 45,00 ± 2,14  (8) |
| 35 | 44,4 ± 1,50 | 41,40 | 47,40 | 47,00 ± 2,81  (11) | 46,50 ± 1,73  (7) |
| 36 | 45,3 ± 1,70 | 41,90 | 48,70 | 46,00 ± 1,46  (9) | 48,50 ± 6,65  (5) |

**Table 4.** Assessment of the chest circumference of stillborn and died newborns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gestational age, weeks** | **Standard indicators of chest circumference,**  **cm** | | | **Chest circumference according to study data, cm** | |
| **Stillborn**  **(*n* = 130)** | **Died newborns**  **(*n* = 96)** |
| ***М* ± *σ*** | ***М*− 2*σ*** | ***М*+ 2*σ*** | ***М* ± *σ*** | |
| 28 | 23,9 ± 1,9 | 20,10 | 27,70 | 19,40 ± 5,91  (22) | 24,00 ± 5,12  (15) |
| 29 | 25,7 ± 1,7 | 22,30 | 29,10 | 20,00 ± 6,97  (18) | 21,67 ± 2,59  (14) |
| 30 | 26,4 ± 1,4 | 23,60 | 29,20 | 22,67 ± 4,75  (16) | 24,00 ± 3,52  (12) |
| 31 | 26,7 ± 1,6 | 23,50 | 29,90 | 24,54 ± 4,85  (15) | 26,85 ± 3,54  (11) |
| 32 | 27,9 ± 1,9 | 24,10 | 31,70 | 25,14 ± 4,76  (14) | 27,67 ± 1,34  (13) |
| 33 | 28,4 ± 1,7 | 25,00 | 31,80 | 23,00 ± 2,96  (13) | 29,00 ± 0,67  (11) |
| 34 | 28,9 ± 1,7 | 25,50 | 32,30 | 29,50 ± 3,27  (12) | 27,00 ± 0,95  (8) |
| 35 | 29,6 ± 1,6 | 26,40 | 32,80 | 29,00 ± 1,45  (11) | 28,50 ± 3,21  (7) |
| 36 | 30,1 ± 1,9 | 26,30 | 33,90 | 30,00 ± 7,05  (9) | 32,00 ± 2,36  (5) |

**Table 5.** Assessment of head circumference indicators of stillborn and died newborns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gestational age, weeks** | **Standard indicators of head circumference,**  **cm** | | | **Head circumference according to study data,**  **cm** | |
| **Stillborn**  **(*n* = 130)** | **Died newborns**  **(*n* = 96)** |
| ***М* ± *σ*** | ***М* − 2*σ*** | ***М* + 2*σ*** | ***М* ± *σ*** | |
| 28 | 23,9 ± 1,9 | 20,10 | 27,70 | 19,40 ± 9,21  (22) | 24,00 ± 0,48  (15) |
| 29 | 25,7 ± 1,7 | 22,30 | 29,10 | 20,00 ± 3,23  (18) | 21,67 ± 0,81  (14) |
| 30 | 26,4 ± 1,4 | 23,60 | 29,20 | 22,67 ± 4,53  (16) | 24,00 ± 3,23  (12) |
| 31 | 26,7 ± 1,6 | 23,50 | 29,90 | 24,57 ± 2,86  (15) | 26,01 ± 3,28  (11) |
| 32 | 27,9 ± 1,9 | 24,10 | 31,70 | 25,14 ± 2,87  (14) | 27,67 ± 1,22  (13) |
| 33 | 28,4 ± 1,7 | 25,00 | 31,80 | 23,00 ± 3,56  (13) | 29,00 ± 0,81  (11) |
| 34 | 28,9 ± 1,7 | 25,50 | 32,30 | 29,50 ± 2,13  (12) | 27,00 ± 0,49  (8) |
| 35 | 29,6 ± 1,6 | 26,40 | 32,80 | 29,00 ± 4,21  (11) | 28,50 ± 0,63  (7) |
| 36 | 30,1 ± 1,9 | 26,30 | 33,90 | 30,00 ± 3,56  (9) | 32,00 ± 0,87  (5) |

**Table 6.** Assessment of mass-height indicators of stillborn and died newborns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gestational age, weeks** | **Standard indicators of mass-height indicators** | | | **Mass-height indicators** | |
| **Stillborn**  **(*n* = 130)** | **Died newborns**  **(*n* = 96)** |
| ***М* ± *σ*** | ***М* − 2*σ*** | ***М* + 2*σ*** | ***М* ± *σ*** | |
| 28 | 31,2 ± 3,9 | 23,4 | 39 | 29,59 ± 6,52  (22) | 27,87 ± 2,26  (15) |
| 29 | 36,3 ± 3,3 | 29,7 | 42,9 | 24,33 ± 8,56  (18) | 35,90 ± 9,98  (14) |
| 30 | 39,4 ± 3,7 | 32 | 46,8 | 32,38 ± 10,54  (16) | 30,45 ± 6,96  (12) |
| 31 | 41,9 ± 4,3 | 33,3 | 50,5 | 38,70 ± 18,25  (15) | 34,88 ± 5,89  (11) |
| 32 | 44,1 ± 5,3 | 33,5 | 54,7 | 38,42 ± 6,54  (14) | 42,23 ± 4,57  (13) |
| 33 | 46,4 ± 4,6 | 37,2 | 55,6 | 33,62 ± 3,69  (13) | 45,30 ± 4,36  (11) |
| 34 | 49,9 ± 4,9 | 40,1 | 59,7 | 49,76 ± 6,78  (12) | 48,06 ± 0,36  (8) |
| 35 | 51,7 ± 4,6 | 42,5 | 60,9 | 49,18 ± 4,86  (11) | 46,01 ± 16,58  (11) |
| 36 | 53,6 ± 4,9 | 44,22 | 62,98 | 53,32 ± 16,48  (9) | 57,24 ± 4,32  (9) |

**Table 7.** Assessment of anthropometric data of premature babies via Fenton curves

|  |  |  |
| --- | --- | --- |
| **Percentiles** | **Stillborn,**  **% (abs.)** | **Died newborns,**  **% (abs.)** |
| ***Body weight*** | | |
| < P3 | 16,0 (21) | 0,0 (0) |
| P3–10 | 12,0 (16) | 15,4 (14) |
| P10–50 | 32,0 (41) | 33,3 (32) |
| P50–90 | 30,7 (39) | 43,6 (43) |
| P90–97 | 4,0 (5) | 2,6 (3) |
| > P97 | 5,3 (7) | 5,1 (5) |
| Total | 100,0 (130) | 100,0 (96) |
| ***Body length*** | | |
| < P3 | 13,2 (17) | 7,9 (8) |
| P3–10 | 3,9 (5) | 5,3 (5) |
| P10–50 | 32,9 (43) | 28,9 (28) |
| P50–90 | 28,9 (38) | 42,1 (41) |
| P90–97 | 3,9 (5) | 10,5 (10) |
| > P97 | 17,1 (22) | 5,3 (5) |
| Total | 100,0 (130) | 100,0 (96) |
| ***Head circumference*** | | |
| < P3 | 21,9 (28) | 5,3 (5) |
| P3–10 | 15,6 (21) | 5,3 (5) |
| P10–50 | 18,8 (25) | 10,5 (9) |
| P50–90 | 21,9 (29) | 68,4 (66) |
| P90–97 | 9,4 (12) | 0,0 (0) |
| > P97 | 12,5 (16) | 10,5 (10) |
| Total | 100,0 (130) | 100,0 (96) |

**Table 8.** Assessment of anthropometric data of full-term newborns died at perinatal period by whole method

| **Physical development corridor** | **Centiles** | **Quantities value** | **Died *n* = 58**  **% (abs.)** |
| --- | --- | --- | --- |
| 1st and lower | < 3 | very low | 8 (5) |
| 2nd | 3–10 | low | 12 (7) |
| 3rd | 10–25 | below average | 14 (8) |
| 4th, 5th | 25–75 | average | 46 (27) |
| 6th | 75–90 | above average | 10 (6) |
| 7th | 90–97 | high | 6 (3) |
| 8th and above | > 97 | very high | 4 (2) |

**Table 9.** Indicators of the *z*-score in assessing of anthropometric data in full-term newborns

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Physical development indicators** | ***z*-score** | | | **Total** |
| **< −2** | **± 2** | **> +2** |
| Body weight to age, % (abs.) | 5,9 (4) | 90,4 (53) | 3,6 (2) | 100,0 (58) |
| Body length / height to age, % (abs.) | 4,1 (3) | 64,3 (37) | 31,6 (18) | 100,0 (58) |
| BMI, % (abs.) | 22,3 (13) | 75,8 (44) | 1,9 (1) | 100,0 (58) |

*Note.* BMI (ИМТ) — body mass index.

**Table 10.** Assessment of gestational age, body weight, and body length considering the time of death of newborns died at early neonatal period

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Time of death** | ***М ± m*** | ***Min*** | ***Max*** | ***Q*25** | ***Me*** | ***Q*75** |
| **Gestational age, weeks *(р = 0,57)\**** | | | | | | |
| 1st day (106) | 33,43 ± 0,90 | 24,00 | 42,00 | 26,00 | 35,50 | 39,00 |
| 2nd day (28) | 29,80 ± 2,07 | 22,00 | 40,00 | 26,00 | 27,50 | 36,00 |
| 3rd day (20) | 28,63 ± 1,95 | 24,00 | 40,00 | 25,50 | 26,00 | 31,00 |
| 1–3 days (154)\* | 32,18 ± 0,84 | 22,00 | 42,00 | 26,00 | 32,00 | 39,00 |
| 4–7 days (43)\* | 31,19 ± 1,35 | 26,00 | 40,00 | 26,00 | 29,50 | 37,00 |
| ***Body weight, g (р = 0,17)\**** | | | | | | |
| 1st day (106) | 2331,81 ± 192 | 480,00 | 5140,00 | 970,00 | 2450,00 | 3620,00 |
| 2nd day (28) | 1829,67 ± 340 | 490,00 | 3810,00 | 715,00 | 1583,00 | 2860,00 |
| 3rd day (20) | 1576,09 ± 341 | 750,00 | 3828,00 | 790,00 | 860,00 | 2319,00 |
| 1–3 days (154)\* | 2129,86 ± 154 | 480,00 | 5140,00 | 860,00 | 2060,00 | 3250,00 |
| 4–7 days (43)\* | 1661,59 ± 258 | 625,00 | 3890,00 | 880,00 | 1160,00 | 2100,00 |
| ***Body length, cm (р = 0,25)\**** | | | | | | |
| 1st day (106) | 44,61 ± 1,37 | 29,00 | 59,00 | 35,50 | 46,00 | 52,00 |
| 2nd day (28) | 40,09 ± 2,62 | 28,00 | 53,00 | 33,00 | 36,00 | 50,00 |
| 3rd day (20) | 37,13 ± 3,26 | 29,00 | 54,00 | 29,50 | 35,00 | 42,50 |
| 1–3 days (154)\* | 42,87 ± 1,17 | 28,00 | 59,00 | 35,00 | 45,00 | 52,00 |
| 4–7 days (43)\* | 39,88 ± 2,23 | 31,00 | 56,00 | 32,50 | 36,00 | 46,00 |

*Note.* <\*> — comparison of anthropometric data of newborns considering the time of death on days 1-3 and 4-7.

**Fig. 1.** Comparative analysis of body weight at birth of children died at perinatal period in certain regions in the Northwestern Federal District

Child’s weight (kg) / Gestational age (weeks)

Mean value

Confidence interval

Murmansk Oblast

Republic of Karelia

Kaliningrad Oblast

Arkhangelsk Oblast

Novgorod Oblast

Volgograd Oblast

Pskov Oblast

Saint Petersburg

**Fig. 2.** Comparative analysis of body length at birth of children died at perinatal period in certain regions in the Northwestern Federal District

Child’s height (cm) / Gestational age (weeks)

Mean value

Confidence interval

Murmansk Oblast

Republic of Karelia

Kaliningrad Oblast

Arkhangelsk Oblast

Novgorod Oblast

Volgograd Oblast

Pskov Oblast

Saint Petersburg

**Fig. 3.** Comparative analysis of the gestational age of children died at perinatal period in certain regions in the Northwestern Federal District

Gestational age at delivery

Murmansk

Karelia

Kaliningrad

Arkhangelsk

Veliky Novgorod

Volgograd

Pskov

Saint Petersburg

**RESEARCH LIMITATIONS**

Retrospective type of the study (including only analysis of medical records that did not always contain all the necessary data) did now allow us to fully evaluate the individual anthropometric parameters of children died in the perinatal period at the age of 22 to 28 weeks of gestation as there were no data on head and chest circumference. Population studies in Russian Federation regarding assessment of anthropometric parameters of children died in the perinatal period have not been performed in recent times.

**FINANCING SOURCE**

Not specified.

**DISCLOSURE OF INTERESTS**

Not declared.