中文摘要

吉林省中小学生实施“农村义务教育学生营养改善计划”相关体质指标调查分析

目的：

通过调查分析吉林省“农村义务教育学生营养改善计划”（以下简称“营养改善计划”）中小学生体格发育状况和营养状况，评价吉林省试点地区营养改善计划的实施效果，分析存在的营养健康问题，为吉林省制定和调整学生营养相关政策提供科学依据。

方法：

收集吉林省 2021 年 13 个试点县的中小学生监测数据，其中实施学生营养改善计划的 12 个试点县为干预组，未实施学生营养改善计划的 1 个试点县为未干预组。干预组与未干预组的监测学生均进行相关体质指标监测，内容包括身高、体重等指标，其中血红蛋白、体能、视力按国家营养改善计划要求进行抽样监测。使用 Excel2010 对数据进行整理、归纳，使用 SPSS24.0 对数据进行统计分析，定量资料的比较采用 *t* 检验、方差分析等，定性资料采用卡方检验进行比较。检验水准 α=0.05，*P*＜0.05 认为差异有统计学意义。

结果：

1. 研究对象基本情况。2021 年吉林省营养改善计划共监测 13 个县、128 个学校，有效监测学生共计 30944 名，其中男生 15923 人，女生 15021 人。不同试点县不同性别构成较为均衡，男生、女生所监测比例达到各占约 50%。研究对象干预前不同学段、不同性别中年龄、身高、体重等项目无显著性差异（*P*＞0.05），具有可比性。实施干预措施的 12 个县中，监测的小学和初中将提供的 4 元膳食补助用于午餐，未实施干预措施的通化县无膳食补助。

2. 身高体重发育状况。干预组男生 10 岁-15 岁年龄组、女生 12 岁-15 岁年龄组身高均值显著高于全国均值（*P*＜0.05）；男生、女生各年龄组体重均值均显著高于全国均值（*P*＜0.05）。初中学段男生身高、体重均值普遍高于女生，

男生身高增长在初中之后呈快速上升趋势，而女生身高在初中增长趋势较为平缓。男生在14岁年龄组体重与全国均值差值最大，为6.66kg；女生在15岁年龄组体重与全国均值差值最大，为 5.70kg。与未实施营养干预的通化县相比，干预组男生 9 岁、11 岁、12 岁、女生 11 岁、13 岁、14 岁年龄组身高均值高于未干预组，差异有统计学意义（P＜0.05)。干预组男生 11 岁、13 岁、女生 9 岁、14 岁、15 岁年龄组体重均值高于未干预组，差异有统计学意义（P＜0.05)。

3. 肺活量状况。干预组肺活量评价优秀的学生 811 人，占比 26.48%；评价良好的学生共505人，占比16.49%；评价及格的学生共1422人，占比46.43%；评价不及格的学生共 325 人，占比 10.61%。与未实施营养干预的通化县相比，干预组男生 7-13 岁年龄组肺活量均值均显著高于未干预组（P＜0.05)，干预组女生7-15岁年龄组肺活量均值均显著高于未干预组（P＜0.05)。

4. 50米跑状况。干预组50米跑成绩评价结果为上等水平的学生共163人，占比 5.42%；评价结果为中上等水平的学生共 580 人，占比 19.28%；评价结果为中等水平的学生共 1159 人，占比 38.52%；评价结果为中下等水平的学生共914人，占比30.38%；评价结果为下等水平的学生共193人，占比6.41%。与未实施干预措施的通化县相比。干预组男生10-12岁、女生11岁、13岁、15岁年龄组50米跑成绩用时显著少于未干预组（P＜0.05)。

5. 营养不足、超重/肥胖状况。干预组总体营养不足检出率为 5.80%，其中生长迟缓检出率为 0.33%，消瘦检出率为 5.47%。总体超重/肥胖检出率为38.00%，其中超重检出率为15.80%，肥胖检出率为22.20%。男生营养不足检出随年龄呈上升趋势，女生呈下降趋势；男生超重/肥胖检出率随年龄先上升再下降，女生超重/肥胖趋势较为平稳。与未实施营养干预的通化县相比，干预组总体营养不足检出率（5.80%）低于未干预组营养不足检出率（6.63%），差异无统计学意义（P＞0.05）；干预组超重/肥胖检出率（38.00%）高于未干预组超重/肥胖检出率（36.46%），差异无统计学意义（P＞0.05）。

6. 贫血状况。干预组总体贫血检出率为 11.42%，女生贫血检出率（7.22%）高于男生（4.20%），差异有统计学意义（P＜0.05）。男生贫血检出率随年龄增加呈下降趋势，女生贫血检出率随年龄增加呈先下降又上升的趋势。与未实施营养干预的通化县相比，干预组贫血检出率高于未干预组，差异无统计学意义

（$P>0.05$）。

7. 视力不良状况。干预组轻度视力不良检出 407 人，检出率为 13.29%；中度视力不良检出 745 人，检出率为 24.33%；重度视力不良检出 891 人，检出率为 29.10%。男生、女生视力不良检出率随着年龄的增加而增加。年龄越大，重度视力不良检出率越高，15 岁年龄组男生重度视力不良检出率达 44.44%，女生检出率为 53.51%。与未实施营养干预的通化县相比，干预组视力不良检出率为 66.72%，高于未干预组检出率 63.77%，差异无统计学意义（$P>0.05$）。

结论：

1. 吉林省农村地区营养改善计划实施后，干预组中小学生身高、体重总体呈上升趋势，干预组身高、体重均值明显高于未干预组。

2. 干预组中小学生肺活量显著高于未干预组。干预组 50 米跑速度显著高于未干预组。

3. 监测地区的学生目前存在营养不足和超重肥胖双重问题，营养改善计划实施后，有效缓解了该地区营养不足问题。

4. 干预组贫血检出率为 11.42%，未干预组贫血检出率为 9.76%，但两组贫血检出率无显著差异。

5. 干预组视力不良检出率为 66.72%，未干预组视力不良检出率为 63.77%，但两组视力不良检出率无显著差异。

关键词：

营养改善，中小学生，农村地区，营养状况，体格发育

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论文题目：吉林省中小学生实施“农村义务教育学生营养改善计划”相关体质指标调查分析

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Abstract

Investigation and Analysis of Physical Indicators Related to the Implementation of “Rural Compulsory Education Student Nutrition Improvement Plan” for Primary and Secondary School Students in Jilin Province

Objective:

To investigate and analyze the physical development and nutritional status of primary and secondary school students in Jilin Province under the "Nutrition Improvement Program for Rural Compulsory Education Students" (hereinafter referred to as "Nutrition Improvement Program"), to evaluate the implementation effect of the Nutrition Improvement Program in pilot areas of Jilin Province, to analyze the existence of The purpose of this study was to evaluate the implementation effect of the nutrition improvement program in the pilot areas of Jilin Province, analyze the nutritional health problems, and provide a scientific basis for the formulation and adjustment of student nutrition policies in Jilin Province.

Methods:

The monitoring data of primary and secondary school students in 13 pilot counties in Jilin Province in 2021 were collected, of which 12 pilot counties implementing the student nutrition improvement program were the intervention group and 1 pilot county not implementing the student nutrition improvement program was the non-intervention group. The students in the intervention group and the non-intervention group were monitored for relevant physical indicators, including height, weight and other indicators, among which hemoglobin, physical fitness and visual acuity were sampled and monitored according to the requirements of the National Nutrition Improvement Program. The data were organized and summarized using Excel2010, and the data were statistically analyzed using SPSS24.0. The comparison of quantitative information was performed by t-test and ANOVA, and the comparison of qualitative information was performed by chi-square test. Test level $\alpha = 0.05$, $p < 0.05$ considered a statistically significant difference.

Results:

1. Basic information of the study population. 2021 Jilin Province Nutrition Improvement Program was monitored in 13 counties and 128 schools, with a total of 30,944 students effectively monitored, including 15,923 boys and 15,021 girls. The composition of different sexes in different monitoring sites was more balanced, and the proportion of boys and girls monitored reached about 50% each. There were no significant differences in age, height, and weight among the study subjects before the intervention in different grades and genders ($p>0.05$), which were comparable. Of the 12 counties that implemented the intervention, the monitored elementary and middle schools used the $4 meal allowance provided for lunch, and there was no meal allowance in Tonghua County, which did not implement the intervention.

2. Height and weight development status. The mean height values of the intervention group were significantly higher than the national average for the age groups of 10-15 years for boys and 12-15 years for girls ($p<0.05$); the mean weight values of all age groups for boys and girls were significantly higher than the national average ($p<0.05$). The mean height and weight values of boys were generally higher than those of girls in junior high school, and the height growth of boys showed a rapid upward trend after junior high school, while the height growth trend of girls was more moderate in junior high school. The greatest difference in weight from the national mean was 6.66 kg for boys in the 14-year-old age group and 5.70 kg for girls in the 15-year-old age group. Compared with Tonghua County without nutritional intervention, the mean height values were higher in the intervention group than in the non-intervention group for boys at ages 9, 11, and 12 and girls at ages 11, 13, and 14, and the differences were statistically significant ($p<0.05$). The mean values of weight were higher in the intervention group than in the non-intervention group in the age groups of 11, 13, and 9, 14, and 15 years for boys, and the difference was statistically significant ($p<0.05$).

3. Hpirometry status. There were 811 students (26.48%) with excellent spirometry evaluation in the intervention group, 505 students (16.49%) with good evaluation, 1422 students (46.43%) with passing evaluation, and 325 students (10.61%) with failing evaluation. Compared with Tonghua County without nutritional intervention, the mean values of lung capacity in the age group of 7-13 years were significantly higher in the intervention group for boys than in the non-intervention group ($p<0.05$), and the mean values of lung capacity in the age group of 7-15 years were significantly higher in the

intervention group for girls than in the non-intervention group ($p<0.05$).

4. 50-meter running status. A total of 163 students (5.42%) were evaluated at the upper level of 50-meter running performance in the intervention group; 580 students (19.28%) were evaluated at the upper intermediate level; 1159 students (38.52%) were evaluated at the intermediate level; 914 students (30.38%) were evaluated at the lower intermediate level; and A total of 193 students, or 6.41%, were evaluated as inferior. Compared with Tonghua County, where the intervention was not implemented. The time taken for 50-meter running performance in the age groups of 10-12 years old for boys and 11, 13 and 15 years old for girls in the intervention group was significantly less than that in the non-intervention group ($p<0.05$).

5. Undernutrition and overweight/obesity status. The overall detection rate of undernutrition in the intervention group was 5.80%, including 0.33% for growth retardation and 5.47% for wasting. The overall overweight/obesity detection rate was 38.00%, including 15.80% overweight detection rate and 22.20% obesity detection rate. The detection of undernutrition among male students showed an increasing trend with age, while female students showed a decreasing trend; the detection rate of overweight/obesity among male students increased and then decreased with age, while the trend of overweight/obesity among female students was relatively stable. Compared with Tonghua County without nutrition intervention, the overall under-nutrition detection rate of the intervention group (5.80%) was lower than that of the non-intervention group (6.63%), and the difference was not statistically significant ($p>0.05$); the overweight/obesity detection rate of the intervention group (38.00%) was higher than that of the non-intervention group (36.46%), and the difference was not statistically significant ($p>0.05$). statistically significant ($p>0.05$).

6. Anemia status. The overall anemia detection rate in the intervention group was 11.42%, and the anemia detection rate was higher in girls (7.22%) than in boys (4.20%), with a statistically significant difference ($p<0.05$). The anemia detection rate of male students showed a decreasing trend with increasing age, while the anemia detection rate of female students showed a decreasing and then increasing trend with increasing age. Compared with Tonghua County without nutritional intervention, the detection rate of anemia in the intervention group was higher than that in the non-intervention group, and the difference was not statistically significant ($p>0.05$).

7. Poor visual acuity status. In the intervention group, 407 people with mild visual impairment were detected, with a detection rate of 13.29%; 745 people with moderate visual impairment were detected, with a detection rate of 24.33%; 891 people with severe visual impairment were detected, with a detection rate of 29.10%. The detection rate of poor visual acuity among boys and girls increased with age. The older the age, the higher the detection rate of severe visual impairment. 44.44% of boys and 53.51% of girls were detected with severe visual impairment in the 15-year-old age group. Compared with Tonghua County, where no nutritional intervention was implemented, the detection rate of poor vision in the intervention group was 66.72%, which was higher than the detection rate of 63.77% in the non-intervention group, and the difference was not statistically significant ($p > 0.05$).

Conclusion:

1. After the implementation of the nutrition improvement program in rural areas of Jilin Province, the overall height and weight of primary and secondary school students in the intervention areas showed an increasing trend, and the mean values of height and weight in the intervention group were significantly higher than those in the non-intervention group.

2. The spirometry of primary and secondary school students in the intervention group was significantly higher than that of the non-intervention group. The 50-meter running speed of the intervention group was significantly higher than that of the non-intervention group.

3. The students in the monitored area currently have the dual problems of undernutrition and overweight and obesity, and the implementation of the nutrition improvement program has effectively alleviated the problem of undernutrition in the area.

4. The detection rate of anemia was 11.42% in the intervention group and 9.76% in the non-intervention group, but there was no significant difference in the detection rate of anemia between the two groups.

5. The detection rate of poor visual acuity was 66.72% in the intervention group and 63.77% in the non-intervention group, but there was no significant difference in the detection rate of poor visual acuity between the two groups.

Key words:

Nutritional improvement, primary and secondary school students, rural areas, nutritional status, physical development

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