



Measurement of Posture in Children Aged 4-6 Years at Aisyah Makam Haji 1 Kartasura Kindergarten

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Abstract

Health screening is a form of monitoring children's growth and development, which involves evaluating growth and development status based on weight gain and addressing problems that may arise at each stage of a child's development. Physical health is measured by age, weight and height. The importance of conducting health checks on children early on is a crucial effort in detecting and preventing various health problems that may arise, including the problem of poor posture better known as bad posture. Bad posture is a condition in which the body's position deviates from the normal state which can cause various health problems. The possible negative consequences of bad posture include problems such as kyphosis, lordosis and scoliosis. Regular health checks on children, especially at early developmental stages such as in kindergarten, are important to identify early any potential health problems, including posture problems. By detecting such problems early, preventive measures can be taken immediately to avoid potentially more serious long-term impacts on children's health. Therefore, regular health check-ups in children are a necessity that cannot be ignored to maintain the health and well-being of future generations. In realizing the research results with quantitative methods, measurable and numerical-based data collection is involved to gain a deeper understanding of the posture characteristics of children in that age range. This provides a solid foundation for implementing appropriate preventive and posture corrective measures. The conducted research revealed intriguing findings regarding the posture of children at Aisyah Makam Haji 1 Kartasura Kindergarten. Among the observations: 56% of children were underweight, 10 children exhibited low arches on both feet, and 22% showed signs of scoliosis with a vertebral curve of 0°. While most children displayed normal limb length differences, some exhibited abnormalities in this aspect. These findings underscore the significance of posture screening for children aged 4-6 years, even if they seem physically healthy. Preventive measures, such as education for parents, are needed to prevent postural disorders that could potentially arise in the future.

1. Introduction

Every stage of children's growth and development should be carefully monitored, emphasizing the importance of early health check-ups. Health checks are a form of monitoring children's growth and development in the form of determining growth and development status based on weight gain and following up on disorders at each stage of child growth and development (Riawati & Hanifah, 2017). Despite being in the period of growth and development, children cannot be separated from health problems. One of the common health problems in children is bad posture. Posture is a set of interactions between the skeletal muscle system on the afferent and efferent pathways of the central nervous system whose role is to keep the body in a balanced state, protecting the supporting structures of the central nervous system against injury or progressive deformity. Meanwhile, bad posture is the perception of a body that deviates from a normal position which can lead to health problems (Washfanabila et al., 2018).

According to several teachers at Aisyiah Makam haji I Kindergarten, children who attend this kindergarten are children who are entrusted by their parents to learn through play under the supervision of teaching staff while their parents are at work. Engaging in play-based learning in kindergarten helps develop children's motor, sensory, social, emotional, and functional skills. Children of kindergarten age are still included in the golden mass of growth and development, where one of the abilities in kindergarten children that develop rapidly is their physical abilities. The development of children's physical abilities will affect and be influenced by children's physical activities, namely playing (Sujiono et al., 2016). In addition to playing, there are behavioural factors that can affect children's physical growth and development (Sari, D. N. & Anna, A. N., 2023). These behavioural factors include the use of daily bags, sitting habits, and types of movement behaviour. Some of these things can trigger abnormalities in children's physical posture.

Some health problems caused by poor posture are kyphosis, lordosis and scoliosis. Kyphosis is a spinal disorder in which the vertebral curve increases anteriorly (Prastiwi et al., 2020). Then lordosis is a spinal disorder in which the vertebral curve increases in the posterior direction. Furthermore, scoliosis is an increase in the curvature of the vertebral curve towards the side so that it can result in a "C" or "S" shaped vertebra (Pristianto et al., 2022). Posture disorders in the spine mentioned earlier can be caused by several things such as sitting for too long, poor study positions, using backpacks with heavy loads, inadequate learning facilities (study tables and chairs), lack of physical activity and exercise, and genetic factors (heredity). Prolonged sitting in a chair can increase strain on the back and hip muscles and cause strain on the joints in a static position for a long time.

Posture disorders are not yet felt in kindergarten children, but parents should already pay attention to the development and growth of children's physical posture in order to minimize complaints in children in their teenage years. To avoid long-term health problems due to poor posture in children, it is necessary to make preventive efforts in the form of health checks carried out regularly on kindergarten students. It is intended that all parties including teachers and parents can better understand the stages of child growth and development, and know the solutions needed if there is a posture disorder in children.

1. Methods of Implementation

Measurement of posture in children aged 4-6 years at Aisyiah Makam Haji Kindergarten was carried out using quantitative research methods which involved the collection of measurable and number-based data to understand in more depth the posture characteristics of children in this age range. This quantitative method allows for more detailed statistical analysis to identify patterns and relationships between posture variables and other factors. This quantitative approach can provide a more in-depth and objective understanding of the posture conditions of children in the population, as well as provide a solid basis for appropriate posture prevention and improvement efforts.

2. Results and Discussion

Measurement of children's physical posture in Aisyiah Makam Haji 1 Kindergarten children with a vulnerable age of 4-6 years as an effort to detect early and prevent abnormal posture in adolescence later through several measurements, including BMI examination, vital signs, body posture, leg length, scoliosis or degree of vertebral curve, and soles of the feet. The measurement results will be interpreted according to the normal value of each measurement, following the normal value of each measurement.

1. Ideal weight values

Table 1. Ideal weight values for male and female

Age	Male	Female
4 years old	16.3 kg-18.2 kg	16.1 kg-18.0 kg
5 years old	18.3 kg-20.0 kg	18.1 kg-20.0 kg
6 years old	20.1 kg-23.8 kg	20.1 kg-22.6 kg

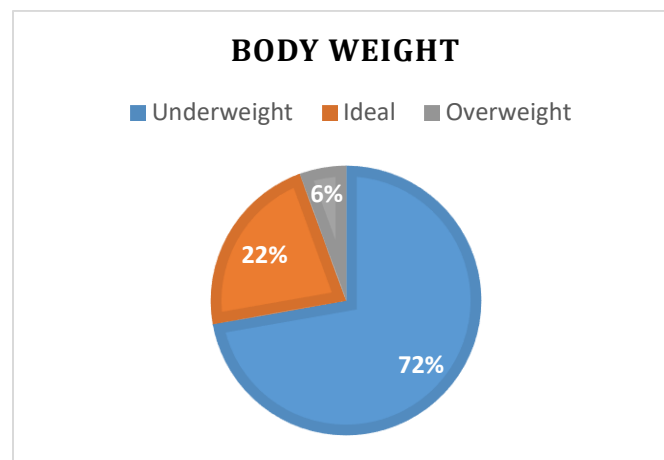


Figure 1. Weight measurement results from Aisyiyah Makam Haji 1 Kindergarten.

From the results of measuring body weight in 18 children, it was found that (22%) 4 children were considered Ideal, (13%) children were underweight, and (6%) 1 child was overweight according to their respective ages. The children with non-ideal weight are as follows:

Table 2. Childrens with non-ideal weight

Age	Initial Identity	Weight	Information
4 years old	Ha	15.30 kg	Underweight
	No	13.05 kg	Underweight
5 years old	Af	15 kg	Underweight
	Ha	17.50 kg	Underweight
	Ma	13.50 kg	Underweight
	Ar	15 kg	Underweight
	Al	15.80 kg	Underweight
	Ra	13.90 kg	Underweight
	Ri	13.90 kg	Underweight
	Maz	15.90 kg	Underweight
	Del	17.05 kg	Underweight
	Sal	23.35 kg	Overweight
6 years old	Ell	17 kg	Underweight
	Na	16.80 kg	Underweight

2. Ideal height values

Table 3. Ideal height values for male and female

Age	Male	Female
4 years old	103.3 cm – 109.4 cm	102.7 cm – 108.9 cm
5 years old	110.0 cm – 115.90 cm	109.1 cm – 115.0 cm
6 years old	116.0 cm – 122.1 cm	115.1 cm – 122.0 cm

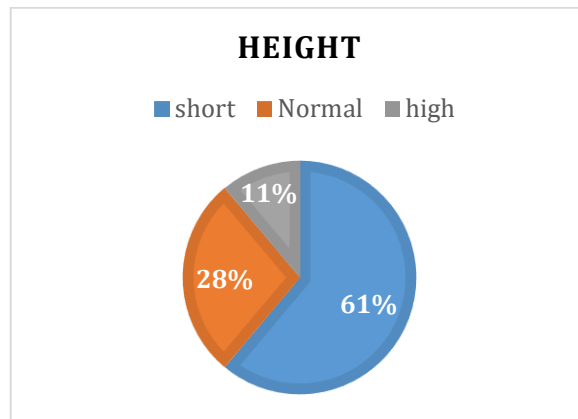


Figure 2. Height measurement from Aisyiyah Makam Haji 1 Kindergarten

From the results of measuring height in 18 children, it was found that (28%) 5 children were considered ideal, (11%) 2 children were tall, and (61%) 11 children were short according to their respective ages. The children with non-ideal height are as follows:

Table 4. Childrens with non-ideal height

Age	Initial Identity	Height	Information
4 years old	No	99.6 cm	Short
5 years old	Av	106.3 cm	Short
	Ma	99.8 cm	Short
	Ar	105.8 cm	Short
	Al	103.1 cm	Short
	Ra	105.1 cm	Short
	Ri	103.6 cm	Short
	Maz	106.7 cm	Short
	Nav	120.6 cm	Tall
	Sal	116.7 cm	Tall
	6 years old	Ell	111.9 cm
Zea		110.5 cm	Short
Na		109.9 cm	Short

3. Ideal BMI values

Table 5. The Ideal BMI values

Age	Male	Female	Normal
4 years old	15.2-15.3	15.3	13.7-16.8
5 years old	15.3	15.2-15.3	13.8-16.8
6 years old	15.3-15.5	15.3-15.4	13.4-17.1

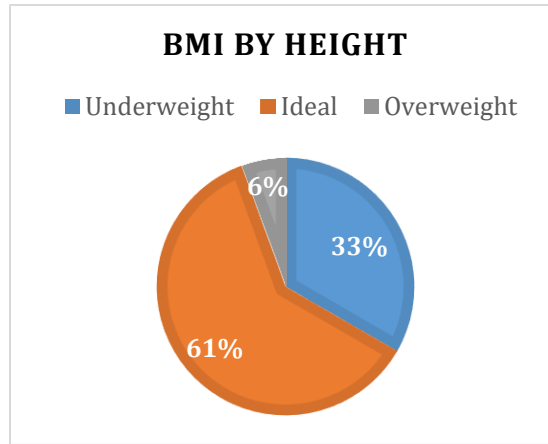


Figure 3. BMI measurement from Aisiyah Makam Haji 1 Kindergarten

From the results of BMI measurements on 18 children, it was found that (61%) 11 children were considered Ideal, (33%) 6 children were underweight, and (6%) 1 child was overweight at their respective ages. The children with BMI are not ideal as follows:

Table 6. Childrens with BMI

Age	Initial Identity	BMI	Information
4 years old	No	13.1	Underweight
5 years old	Af	13.3	Underweight
	Ma	13.6	Underweight
	Ar	13.4	Underweight
	Ri	12.3	Underweight
	De	13.6	Underweight
	Sa	17.1	Overweight
6 years old	Children within ideal limits all		

4. Arcus Degree Value (Arch of the sole)

- Low arcus: <math> < 31^\circ </math>
- Normal arcus: $31^\circ - 45^\circ$
- Hight arcus: $> 45^\circ$

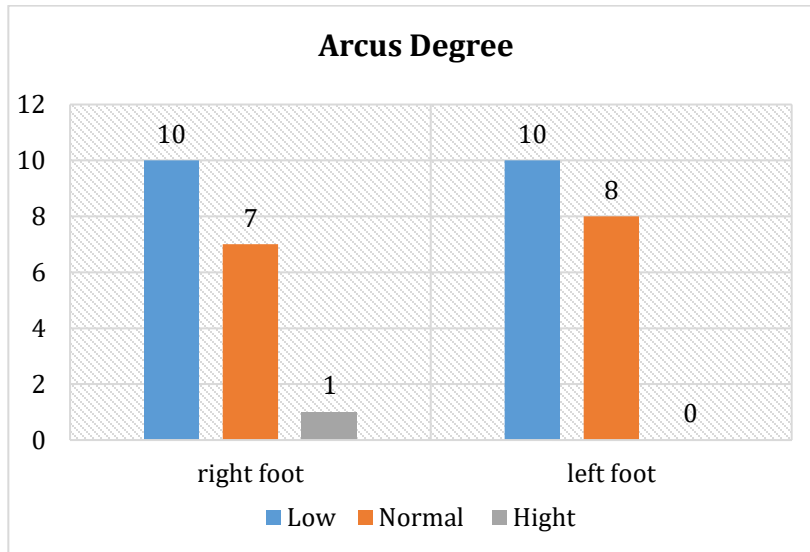


Figure 4. Measurement of arcus size from Aisiyiah Makam Haji 1 Kindergarten.

From the measurement of the Degree of Arcus Pedis (Arch of the sole of the foot) in 18 children, there were 10 children who had low arcus, 7 children who had normal arcus, and 1 child who had high arcus on the right foot. While on the left foot, 10 children have low arcus, 8 children have normal arcus, and 0 children have high arcus.

- Low Arcus

Table 7. Childrens with Arcus Pedis Right and Left Foot

(Right Foot)	(Left Foot)
- Ha (8°)	- Ha (5°)
- Has (20°)	- Has (25°)
- At (5°)	- At (5°)

- No (8°)	- No (8°)
- Ar (10°)	- Ar (20°)
- Al (10°)	- Al (9°)
- Mrai (12°)	- MRai (19°)
- Ri (5°)	- Ell (23°)
- Del (25°)	- Ri (10°)
- Sal (20°)	- Az (20°)

- Normal Arcus

Table 8. Childrens with Normal Arcus right and left foots

(Right Foot)	(Left Foot)
- Av (38°)	- Av (31°)
- Ma (40°)	- Ma (31°)
- Ai (38°)	- Ai (40°)
- NA (45°)	- Na (35°)
- Zea (31°)	- Zea (33°)
- Na (35°)	- Na (42°)
- Ell (41°)	- Del (32°)
-	- Sal (37°)

- Hight Arcus

Table 9. Children with Height Arcus right and lefu foots

(Right Foot)	(Left Foot)
- Az (50°)	- (-)

Upon measuring the foot arches, it was observed that many children still have low arches. However, this is considered normal since, during the ages of 4 to 6 years, or the first 5 years of life, the development of the foot arch, known as the Arcus Pedis, is still underway in kindergarten-aged children.

5. Scoliosis score:

- <math> < 5^\circ </math> normal vertebral curve
- $\geq 5^\circ$ abnormal vertebral curve

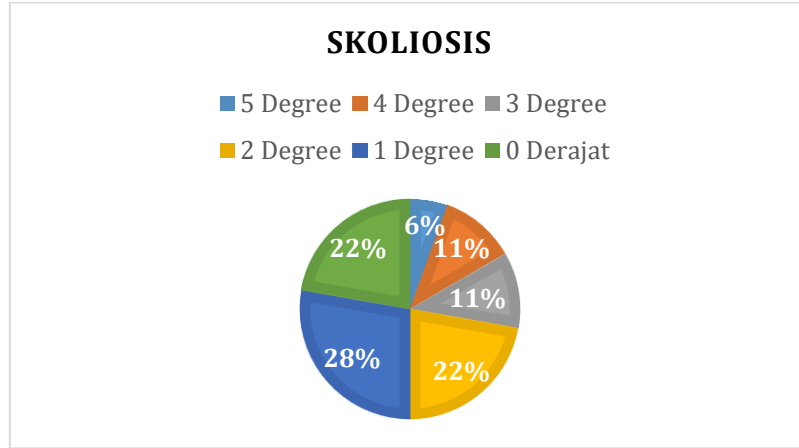


Figure 5. Scoliosis measurement from Aisiyiah Makam Haji 1 Kindergarten
 Among the 18 children assessed for scoliosis, the findings revealed that 4 children had a curvature of 0 degrees, 5 children had a curvature of 1 degree, 4 children had a curvature of 2 degrees, 2 children had a curvature of 3 degrees, 2 children had a curvature of 4 degrees, and 1 child had a curvature of 5 degrees. The child data is as follows:

Table 10. Childrens with assessed for scoliosis

(0 Degree)	(1 Degree)	(2 Degree)	(3 Degree)	(4 Degree)	(5 Degree)
- Ma	- Ha	- Av	- Ha	- At	- Sal
- No	- Ar	- Ai	- Del	- Azka	
- Ell	- Al	- MRai			
- Ri	- Zea	- Na			
	- Na				

6. Normal limb length values

- Normal: difference in length of both limbs <3 cm
- Abnormal: ≥3 cm

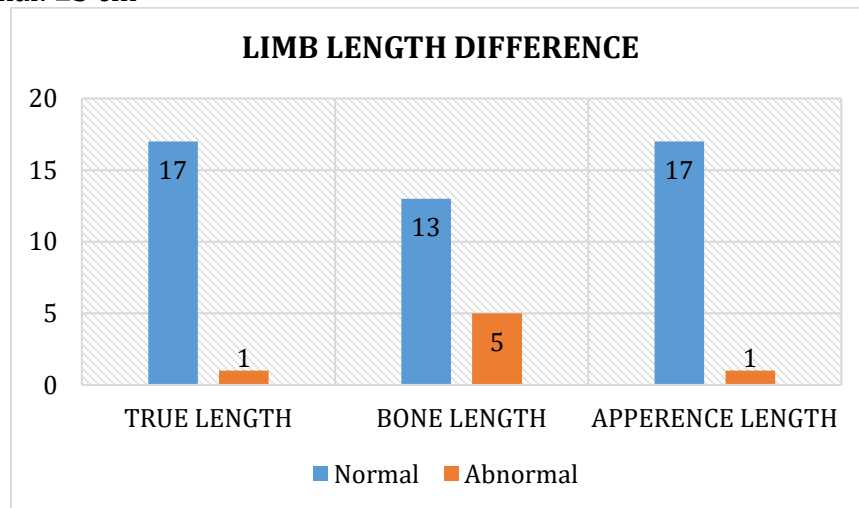


Figure 6. Measurement of limb length difference from Aisiyiah Makam Haji 1 Kindergarten

From the results of measuring the difference in limb length in 18 children that in True Length there are 17 normal children and 1 child is abnormal, in Bone Length there are 13 normal children and 5 abnormal, in Appearance Length there are 17 normal children and 1 abnormal child. The children with abnormal limb length differences are as follows:

- True Length
 - Novero with a difference in the length of the right and left legs of 3 cm
 - Bone Length
 - Avika with a difference in the length of the right and left legs of 3 cm
 - Hasna with a difference in the length of the right and left legs of 5 cm
 - Athafariz with a difference in right and left leg length of 4 cm
 - Alvian with a difference in the length of the right and left legs of 3 cm
 - Elliana with a difference in the length of the right and left legs of 3 cm
- Appearance Length
 - M.Raihan with a difference in the length of the right and left legs 3 cm

In the study conducted on children in Kartasura sub-district, specifically at Aisyah Makam Haji 1 kindergarten, aged between 4 to 6 years, several observations were made. Firstly, in terms of BMI, it was noted that 56% of the children were underweight. Secondly, regarding foot arches, a majority exhibited low arches, with 10 children having low arches on both feet. Thirdly, during the scoliosis examination, it was found that 22% of the children had a vertebral curve of 00, while others had a curve greater than 00. Lastly, in the examination of limb length, most children had normal differences in limb length, although some displayed abnormal differences.

It should be noted that the archus pedis usually begins to form during the first five years of a child's development, with an age range of 2 to 6 years (Karandagh et al., 2015). By the age of 6 years, there is a critical period where the arcus pedis should have formed normally. However, in some children, the arch may not be fully developed due to valgus calcaneus, forward abduction of the pedis and collapse of the longitudinal arch (Munawarah, 2021).

Based on the examination results, significant findings have emerged despite the young age of the children, ranging from 4 to 6 years old. It's evident that some children may appear physically healthy, but underlying issues affecting their posture might go unnoticed. Therefore, proactive follow-up measures are essential to prevent potential complications in the future. This preventive approach could involve educating parents about the importance of regular check-ups and ensuring transparency by sharing the measurement results, enabling parents to track their child's posture development and mitigate the risk of abnormal postures during adolescence.

3. Conclusion

Despite appearing healthy, children during this period are prone to posture problems that may not be visible to the naked eye. Therefore, preventive measures can involve educating parents to understand and monitor their children's posture development. In addition, transparency in conveying children's measurement results is also key. So it is hoped that parents will have a good understanding of their child's posture condition. In

other words, collaboration between medical parents and teachers is one of the important things to maintain the health of children's posture during growth.

4. References

- Prastiwi, R. I., Risy W, R., & Lestari, S. (2020). Postur Kifosis Menyebabkan Gangguan Keseimbangan Statis Lansia. *Jurnal Keterampilan Fisik*, 5(2), 140–146. <https://doi.org/10.37341/jkf.v5i2.225>
- Pristianto, A., Fadhlika, R., K., Safitri, E., F., Utami, P., S., W., Kirani, Y., S., & Nadhirah, S. (2022). Program Preventif Kelainan Postur pada Siswa dan Siswi di MIM Digdaya Bolon. *Jurnal Pengabdian Ilmu Kesehatan*, 2(3), 21–27. <https://doi.org/10.55606/jpikes.v2i3.521>
- Riawati, D., & Hanifah, L. (2017). Evaluasi Pertumbuhan Balita Berdasarkan Umur Dan Berat Badan. *Jurnal Kebidanan Indonesia*, 8(2), 85–96. <https://jurnal.stikesmus.ac.id/index.php/JKebIn/article/download/18/17>
- Sari, D. N., & Anna, A. N. (2023). Pengenalan Kelestarian Lingkungan Hidup untuk Anak Usia Dini di Pos PAUD Ceria. In *Prosiding University Research Colloquium* (pp. 105-111).
- Sujiono, B., Sumatri, M., & Chandrawati, T. (2016). Perkembangan Motorik Anak Taman Kanak-Kanak. *Metode Pengembangan Fisik*, 1–21.
- Washfanabila, K., Rikmasari, R., & Adenan, A. (2018). Hubungan Kebiasaan Buruk Postur Tubuh Dengan Bunyi Kliking Sendi Temporomandibula. *Padjadjaran Journal of Dental Researchers and Students*, 2(1), 36-45. <https://doi.org/10.24198/pjdrs.v2i1.21439>