INTRODUCTION

Adolescence is a period of transition from childhood to adulthood. In this period, hormononal, physical, psychological and social changes occur. A prominent physical alteration is the development of secondary sex signs. These changes can cause certain abnormalities or diseases if not carefully observed. Sexual maturity occurs through regular stages that deliver the child ready for his fertility function.

Puberty is a transitional period in the process of sexual maturation. Puberty is one of the periods in the process of sexual maturation resulting from achieving reproductive abilities. The appearance of secondary sex characteristics characterizes puberty and ends with the arrival of menarches in girls and the complete genital development in boys. The early age of puberty in boys ranges from 9 – 14 years and girls range from 8 – 13 years.

Puberty is said to be late when the initial physical changes of puberty are not seen at the age of 13 in girls and 14 years in boys. Initial suspicion of a delay in puberty when secondary sex characteristics have not been seen in time. The incidence of late puberty is not known for certain. Boys are more often than girls.

Tanner Staging, a Sexual Maturity Rating (SMR), is an objective classification system that providers use to document and track the development and sequence of secondary sex characteristics of subjects during puberty. Marshall and Tanner developed it during the 1940s to 1960s in England. In boys, puberty development is based on the growth of pubic hair and genitals, while in girls, puberty is based on the development of pubic hair that preceeds the development of the breast.

Orphanages are shelters for physical, mental, and social development and a place to provide education, training, skills, and independence for children. There are three categories of children placed in orphanages. There are single orphans, defined as children whose father or mother has passed away, and children who are separated from their parents. Previous studies show that almost 90% of children in orphanages still have at least one parent, while more than 56% have both parents. Besides the poverty factors, a distant place of living still have at least one parent. There are three categories of children placed in orphanages. There are single orphans, defined as children whose father or mother has passed away, and children who are separated from their parents. Previous studies show that almost 90% of children in orphanages still have at least one parent, while more than 56% have both parents. Besides the poverty factors, a distant place is also the main reason for children being placed in orphanages.

Many factors affect the timing
and tempo of pubertal development, including the environment and chronic malnutrition, which delay puberty and slow it down. In Industrialized countries, the age at menarche has decreased markedly since the 19th Century due to improvements in nutrition, sanitation and general health. Belsky and Ellis considered that there was a relationship between early puberty and environmental stressors. Currently, there is no data on puberty patterns in adolescents in orphanages. Based on that, researchers are interested in researching puberty patterns in orphanage adolescents.

**METHODS**

This study used a descriptive design with a cross-sectional approach in December 2021 at the Sekar Pengharapan and the Widhya Asih Badung, Bali Orphanages. The subjects in this study were all children entering puberty at the Sekar Pengharapan and the Widhya Asih Badung, Bali Orphanages. Pengharapan Orphanage met the inclusion and exclusion criteria. The inclusion criteria in this study were adolescents who reached puberty, and the exclusion criteria in this study were adolescents who refused to participate in this study.

Sampling in this study used a consecutive sampling technique, which was carried out sequentially until the number of samples was met. Based on the calculation of the number of samples in this study, there were at least 36, with a total sample of 50 people. Sampling is done by filling out a questionnaire and physically examining the teenager in a separate room. Male doctors examined the teenage boys, and female doctors examined the teenage girls. The physical examination includes a nutritional status examination and a tanner scale examination. In men, the gonadal examination is carried out using an orcidometer. It assesses the development of pubic hair; in women, an examination of breast and pubic hair development is carried out.

In adolescent boys, genitalia and pubic hair examinations are assessed using the Tanner scale of 1 to 5. The Tanner scale 1 is described as a pre-pubescent stage, with a penis length of less than 2.5 cm and a testicular volume of less than 4 ml. On this scale, pubic hair has not yet grown. On the Tanner 2 scale, the length of the penis is more than equal to 2.5 cm, accompanied by an enlargement of the testicles of more than 4 ml with a thinning and slightly reddish scrotum. On this scale, pubic hair is still sparse, slightly pigmented, and curls, especially at the base of the penis. On a Tanner scale of 3, the penis begins to lengthen and widen from the diameter and length of the penis, accompanied by an increased testes volume. Pubic hair begins to grow thicker and curls up to the pubic mons. On the Tanner 4 scale, the penis and testicles get bigger and bigger, along with the darker scrotum. The pubic hair resembles an adult shape but has not yet expanded to the middle. Furthermore, the color of the pubis became darker and darker. On the Tanner scale 5, the shape and size of the penis is an adult shape and size with pubic hair extending to the middle.

Adolescent girls' development of breasts and pubic hair is assessed on a Tanner scale of 1 to 5. The Tanner scale 1 is prepubertal, where the breast elevation is only on the papillae. On this scale, pubic hair has not yet grown. On the Tanner scale 2, it is obtained with breasts and papillae protruding like small hills accompanied by an increased areola diameter. On this scale, pubic hair is still sparse and straight at the medial boundary of the labia. Tanner scale 3 in the breast and areola enlarged, no separation of outlines. Pubic hair begins to be more curly and blacker with increasing numbers. On a Tanner scale of 4, the areola and papillae form a second hill. The pubic hair gets coarser and curly. On the Tanner scale 5, the papillae are increasingly prominent, and the areola is part of the general outline of the breast. Pubic hair spreads to the medial surface of the thigh. Study participants were said to have puberty stages if they were on a Tanner scale of 2 or more, and study participants were said to have delayed puberty if breast and hair development had not been seen at age 13 for girls and 14 years for boys. Nutritional status was measured based on the 2007 WHO reference and grouped into good nutrition, light malnutrition, energy protein, moderate malnutrition, energy protein, heavy malnutrition energy protein, overweight, and obesity. Height is measured by height by age and grouped into stunted and non-stunted.

The data is then analyzed with computer software to describe the characteristics of the research variables. Variables are presented as numbers (n) and percentages (%). The processed data is presented in the form of tables and narratives.

**RESULT**

The study was conducted in two orphanages on December 24, 2022. A total population of 50 adolescents was found in the two orphanages; all adolescents were included in the study because they met the inclusion criteria. The number of subjects included in the research inclusion criteria in the two orphanages was 50 adolescents, consisting of 19 boys (38.0%) and 31 girls (62.0%). Based on the general characteristics of the subject, it was found that the age varied from 13 years to 17 years, with an average age of 15.5 ± 1.3 years. The subjects were dominated by adolescent girls, as many as 31 people (62.0%). There were 3 subjects (6.0%) in prepubertal condition, while most (50.0%) were on the stage 4 Tanner scale. Most subjects had good nutritional status (92.0%), and none were stunted. The length of stay in the orphanage of the subjects included in the study varied between 3 years to 36 years, with an average of 13.3 ± 9.2 years. Data on the general characteristics of study participants are fully presented in **Table 1**.

Most of the male and female subjects in the study were on the stage IV Tanner scale based on the development of the gonads (testicles) and breasts, respectively. In female subjects, it was found that 100% had experienced menarche with an average age of menarche 11.5 ± 0.6 years. This study’s results show a misalignment between the Level of Sexual Maturity in female breasts/male genitalia and pubic hair. The number of subjects and the average age for the developmental stages of adolescent puberty patterns in the two orphanages are presented in **Table 2**.

**DISCUSSION**

The onset of normal puberty in females varies from 8 to 13 years. (Brito, 2015). A study by Feibelmann et al. in Brazil that used a similar design to this study,
Compared to studies conducted in two orphanages today, the average age of women on the Tanner phase II scale based on breast maturity was higher than in the previous two studies (14.0±0.0 years). Based on research conducted by Oelkers et al., women with low socioeconomic status enter puberty on average at the age of 10.2 years and late puberty at 14.6 years. Meanwhile, in the study conducted in the two orphanages, 2 women aged 13 were still in the pre-puberty stage. Further, the onset of normal puberty in males varies from 9 to 14 years. Studies by Brix et al. found the age of achievement of the Tanner scale stage II based on gonadal development was 11.1 years and pubic hair 11.5 years. This study found a higher age in gonadal development, which was 13.3 ± 0.5 years. In addition, the same thing was found in the age of achievement of the Tanner scale stage II based on pubic hair, which was 14.2 ±1.3 years. Based on research conducted by Oelkers et al., entering puberty in men with low socioeconomic status on average at 10.7 years and late puberty at 15.2 years. Meanwhile, in research conducted in orphanages, as many as one of 13-year-old male is still in the pre-puberty stage. The onset of puberty (Tanner stage B2 in women and G2 in males) in both groups in this study occurred at a later age, which may indicate a shorter tempo of puberty.

In this study, the onset of puberty of the male group was found to have a higher average age but was still within the normal range (<14 years or 2 to 2.5 years of primary school above the population average); conversely, in the female group, the onset of puberty was found to be outside the normal range (≥13 years or 2 to 2.5 years of elementary school above the population average). Such delays in puberty can affect the patient’s health and psychosocial. In addition, a longitudinal study by Carrascosa et al. found that adolescents who fell into the pubertal growth spurt onset (PGSO) category late had lower height and growth speed. However, the average height was only slightly below or equal to height in adulthood when compared to normal PGSO. To that end,
confirmation through longitudinal studies is necessary to find further implications of the findings in the form of delayed onset of puberty that may result in this shorter puberty tempo.

Generally, puberty follows predictable patterns of onset, sequence, and speed. Puberty patterns in women are generally preceded by thelarche (breast growth) at about 9 to 10 years old. Furthermore, the process is followed by pubarche, characterized by pubic hair growth about 1 to 1.5 years after the onset of thelarche and menarche or first menstruation in women, which is common about 0.5 to 3 years after thelarche. On the other hand, in males, puberty is usually preceded by an enlargement of the testicles, followed by the growth of pubic hair about 1.0 to 1.5 years later. Furthermore, spermatarche occurs in stage III and IV genital development along with pubertal growth spurt. Finally, the process is ended by masculinization in the form of facial hair appearance and voice changes in stage IV.

The first finding observed in this study in the female group was breast development (14.0±0.0 years) followed by pubic hair growth (15.2±1.2 years). Something similar was also found in the group of men in this study, where testicular enlargement (13.3±0.5 years) occurred ahead of pubic hair growth (14.2±1.3 years). Both findings follow the theory adopted regarding thelarche as an initial process in the process of puberty in women which reflects an increase in estrogen levels due to the secretion of Gonadotropin (Gn) acting on gonadal cells, while gonarche as an initial process in the process of spermatogenesis reflecting the secretion of seminiferous tubule tissue.

Menarche generally occurs at an average age of 12.5 years or 2.5 years after breast development or thelarche. The age at which menarche occurs results from the interaction of various environmental factors, such as nutrition, socioeconomic conditions, psychosocial, childhood experiences, general health, and genetics. Radha et al. found that the average age of menarche was 12.1±1.19 years, and the increase in menarche age was inversely proportional to socioeconomic conditions. On the other hand, the study found that all adolescent girls experienced menarche at an average age of 11.5±0.6 years. It should be underlined that this study examined the adolescent population living in orphanages with socioeconomic conditions that were likely to be lower than the general population. In contrast, various previous studies were conducted on adolescents with different backgrounds. This study has limitations in terms of the design of descriptive cross-sectional studies that do not make long-term observations of the implications of the findings in the form of a slower onset of puberty than the average population. In addition, the population studied in this study cannot be directly compared with the general population given the differences in health level conditions, socioeconomic, psychosocial, and so on that may affect puberty patterns.

CONCLUSION

The level of sexual maturity in orphanage adolescents is relatively normal in the orphanage population. However, there are still 3 teenagers at the age of pre-puberty. The age of menarche in women is relatively normal according to age.

DISCLOSURE

Conflict of Interest

All authors stated no conflict of interest regarding the research and publication.

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Author Contribution

All authors contributed to conducting the research and preparing the publication.

REFERENCES


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