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White coat effect – problem of assessing its incidence and magnitude in children

White coat effect (WCE) is a transient increase of blood pressure (BP) level, occurring in some patients during BP measurement procedure performed by medical staff (6, 13, 14). It is therefore the difference between office BP level and BP level measured in psychophysical relaxation conditions (before visiting physician's office) (7). WCE may cause white coat hypertension (WCH). The problem if WCH should be treated is still controversial (7, 13). On the other hand, there is no doubt that virtual hypertension should be treated. Thus, assessing the magnitude of WCE and detecting WCH seem to be important. Ambulatory blood pressure monitoring (ABPM) have been employed to do it (11, 12, 14). Now it is generally accepted that a measure of WCE magnitude is the difference between office BP and mean daytime ambulatory BP (1, 2, 6, 15). Many scientists and physicians just identify WCE definition with the way of calculating WCE magnitude (2, 14).

The aim of this study is an attempt to assess the incidence and estimate the method of calculating the magnitude of white coat effect (WCE) in healthy children.

MATERIAL AND METHODS

The study group consisted of 59 healthy children (26 girls and 33 boys) aged 10–18 years. The inclusion criteria were as follows: 1 – absence of any disease that might influence blood pressure level, and 2 – absence of any pharmacological treatment.

All children underwent office BP measurement and 24-hour ambulatory blood pressure monitoring (ABPM). ABPM was performed during children's regular school day with normal physical activity. We used Schiller BR 102 device, which employs both auscultatory and oscillometric method. Daytime was defined arbitrarily as the interval between 7 a.m. and 10 p.m. and night-time as the interval between 11 p.m. and 6 a.m., similarly to other studies in pediatric populations (3, 9). Single readings were automatically rejected when daytime systolic blood pressure (SBP) was >220 mm Hg or <70 mm Hg, daytime diastolic blood pressure (DBP) was >140 mm Hg or <40 mm Hg and the difference between SBP and DBP was >120 mm Hg or <20 mm Hg (5). Normal values of night time BP were 90% of daytime values (11). The whole recording was excluded when more than 25 % of readings were erroneous (5). On the basis of ABPM the mean values of daytime SBP and daytime DBP were determined. WCE magnitude was calculated as the difference between the value of office BP and the mean value

of daytime ambulatory BP. It was determined for SBP and DBP separately and expressed in mm Hg.

RESULTS

Average WCE value was (+1.6) mmHg for SBP and (-1.47) mmHg for DBP. WCE ranged from (-43.79) mmHg to (+44.35) mmHg for SBP and from (-66.14) mmHg to (+48.0) mmHg for DBP (Tab.1). WCE was positive in 30 (50.85%) children and negative in 29 (49.15%) children. The scatterplots of WCE in the study group are shown in Figures 1 and 2.

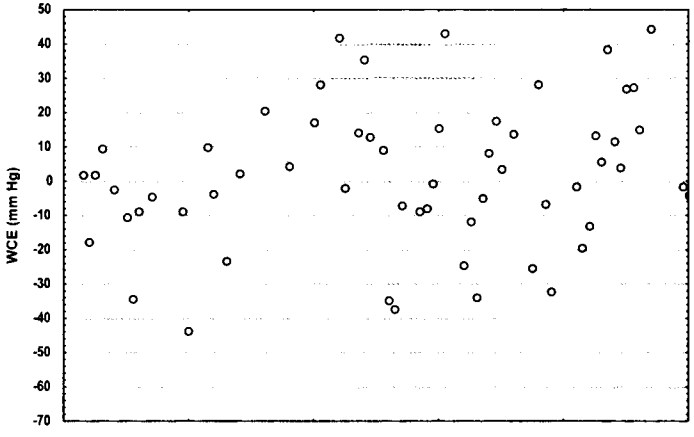

Fig. 1. Scatterplot of WCE value of SBP in the study group

Table 1. Office blood pressure values and ambulatory blood pressure values and white coat effect magnitude in the study group

	Mean ± SD	Minimum	Maximum
Office systolic blood pressure (mm Hg)	121.32 ±22.06	79	173
Office diastolic blood pressure (mm Hg)	83.63 ±20.59	42	138
Mean daytime ambulatory systolic blood pressure (mm Hg)	122.92 ±11.33	96.00	148.35
Mean daytime ambulatory diastolic blood pressure (mm Hg)	82.15 ±8.66	63.93	103.10
White coat effect magnitude for systolic blood pressure (mm Hg)	1.60 ± 20.88	-43.79	44.35
White coat effect magnitude for diastolic blood pressure (mm Hg)	-1.47 ± 20.31	-66.14	48.00

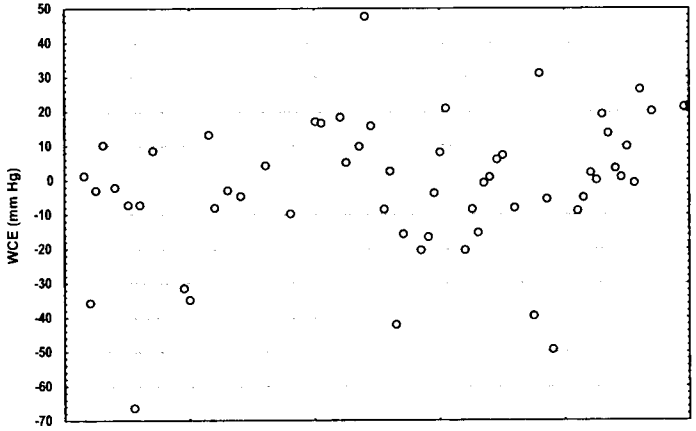

Fig. 2. Scatterplot of value of DBP in the study group

DISCUSSION

WCE values obtained in the study group differ from those in adults (2,14,15). The results of the study indicate that BP elevation observed during office BP measurement procedure occurred in about 51% of children. In the remaining 49% of children office BP was lower than BP considered daytime resting. Thus, in these 49% of children WCE was negative. Negative WCE (whose mechanism is unknown), is called reverse WCE and is an exceptionally rare phenomenon (1). However, in our study a negative value of WCE (calculated with the generally accepted method) occurred when average daytime ambulatory BP was greater than office BP. It seems that high percentage of negative WCE observed in our group results from the assumption that in children daytime ambulatory BP may be identified with resting daytime BP and used to calculate WCE. In adults daytime ambulatory BP values are usually lower than office BP values (2). In children, on the contrary, BP values obtained in ABPM are frequently higher than office BP (3). It is probably because of physical activity which is usually greater in children than in adults (4,9). It seems that average daytime ambulatory BP should not be used to calculate WCE in children. There are even some authors who doubt whether the generally used method of calculating WCE is correct in adults (6, 8, 10). A much smaller difference between office and average daytime ambulatory BP reflects virtual magnitude of WCE in children. Therefore, to estimate properly WCE value in children it is necessary to calculate the real value of daytime resting BP.

CONCLUSIONS

1. Positive WCE was observed in about 50 % of examined children.
2. Mean daytime ambulatory BP level in children may be higher than office BP level. It may be the consequence of higher level of physical activity in children than in adults.
3. Generally accepted method of calculating WCE magnitude in adults seems not to be appropriate in children.

4. Introducing a new method of evaluating WCE in children (different from that used in adults) may be worth consideration.

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SUMMARY

The aim of this study was an attempt to assess the incidence and estimate the method of calculating the magnitude of white coat effect (WCE) in healthy children. 59 healthy children aged 10-18 years underwent office blood pressure (BP) measurement and 24-hour ambulatory blood pressure monitoring (ABPM). WCE magnitude was evaluated according to the generally accepted method, as the difference between office BP and mean daytime ambulatory BP value. WCE magnitude calculated in that way was negative in 49 % children, and positive in 51 % children. Systolic blood pressure WCE ranged from (-43.79) to (+44.35) mmHg; the mean value was (+1.60) mmHg. Diastolic blood pressure WCE ranged from (-66.14) mmHg to (+48.00) mm Hg, and the average was (-1.47) mmHg. 1. Positive WCE was observed in about 50 % of the examined children. 2. Mean daytime ambulatory BP level in children may be greater than office BP level. It may be the consequence of a higher level of physical activity in children than in adults. 3. The generally accepted method of calculating WCE magnitude in adults seems

inappropriate for children. 4. Introducing a new method of evaluating WCE in children (different from that used in adults) may be worth consideration.

Efekt białego fartucha – problem oceny występowania i nasilenia zjawiska u dzieci

Celem pracy była próba oceny częstości występowania i sposobu obliczania wielkości efektu białego fartucha (WCE) u zdrowych dzieci. U 59 zdrowych dzieci w wieku 10–18 lat przeprowadzono tradycyjny pomiar ciśnienia tętniczego (BP) w gabinecie lekarskim oraz 24-godzinny ciągły ambulatoryjny pomiar ciśnienia tętniczego (ABPM). Wielkość WCE obliczano, według powszechnie przyjętego u dorosłych sposobu, jako różnicę pomiędzy BP mierzonym tradycyjną metodą w gabinecie lekarskim oraz średnim dziennym BP w ABPM. Obliczony w ten sposób WCE miał u 49% dzieci wartość ujemną, a u 51% dzieci okazał się dodatni. Wielkość WCE wynosiła od (-43,79)/(-66,14) mmHg do (+44,35)/(+48,00) mmHg, średnio-(+1,60)/(-1,47) mmHg. 1. U około 50% badanych dzieci zaobserwowano dodatni efekt białego fartucha. 2. U dzieci średnie dzienne BP w ABPM może mieć wyższą wartość niż BP mierzone sposobem klasycznym przez personel medyczny. Tłumaczy się to większą niż u dorosłych aktywnością fizyczną dzieci. 3. Przyjęty powszechnie u dorosłych sposób określania wielkości WCE nie wydaje się odpowiedni dla dzieci. 4. Celowe jest rozważenie innego niż u dorosłych sposobu liczenia wielkości WCE u dzieci.