Concordance of weight status and blood pressure between children and adults within households in Karachi, Pakistan: The CONCAR Study

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Background

There is a growing body of literature focusing on the concordance within households of cardiometabolic risk factors in Asia. This includes concordance between parent-child[1], sibling[2,3], spousal dyads[4], and between any co-residing members of households[5,6]. For Pakistan, there is a lack of published data regarding concordance of cardiometabolic risk and factors that can influence the degree of concordance. Additionally, Pakistan has an average household size of 6.8, one of the highest averages in the world. 55% of households are multigenerational and 33% are three generation households, with 49% of all households having cohabiting extended family members[7]. Therefore, intergenerational influences on health may be particularly salient in this setting. There is a need to better understand relationships between household members, especially in a region where there is interaction between multiple variations of individual relationships in a shared environment. The CONcordance of Cardiometabolic Diseases and Risk Factors (CONCAR) in Pakistani Households Study is a cross-sectional study with data collection taking place in Karachi, Pakistan. Data collection was done in a subset of households within clusters that have been established by the ongoing Cardiometabolic Risk Reduction Strategies in South Asia (CARRS) Cohort Study. The purpose of this study was to assess the association between the presence of adults with hypertension or overweight status (BMI > 25) and the blood pressure and weight status of children within the same household.

Methods

CONCAR data collection took place from March to June of 2023 by trained field workers who collected information on demographics, immediate, behavioral, and social risk factors and disease history of cardiometabolic disease, anthropometry, and blood pressure. Inclusion criteria were members of an established CARRS household who are 8 years and older. Pregnant women and those who cannot recall their behavior over the past year, such as those with dementia, were excluded.

Data analysis included descriptive statistics including demographics, average household size, percent overweight, percent hypertensive adults, average BMI-for-age z-score of children (BAZ) using the WHO Growth Reference, and average systolic blood pressure for children. Linear regression was done to analyze associations between 1) presence of hypertension among any household adult and the average systolic blood pressure of children (ages 8-17), and 2) presence of overweight among any household adult and the BAZ of children, controlled for household income and sex of child.

Hypertension was defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg when averaged between two readings (a third reading was taken if the difference between first two systolic was >10 or diastolic was >6). BMI and BAZ were calculated using weight and height measurements taken during the visit. Data was treated as outliers if the adult BMI was <12 or >60 or if the child BAZ was <-5 or >5. Statistical significance was determined using $p < 0.05$. Data was collected via the REDCap mobile application and analyzed using SPSS v29.0.0.0.

Results

The CONCAR Cohort included 1508 participants from 352 households. 158 of these households had at least one child < 18 years, with 916 total participants in the analyzed sample, with 327 children. After removing outliers, the analyzed sample included 904 participants, with 316 children, with an average household size of 5.7. The average age of adults was 40.5 years and of children was 12.6 years. 40.1% of adults and 50.5% of children were male. 20.3% of adults have hypertension, with 50.6% of households having at least one adult with hypertension. 51.4% of adults are overweight, with 82.6% of households having at least one adult who is overweight. Among children, average systolic blood pressure (SBP) is 104.45 +/- 12.55 and the average BAZ is -0.74 +/- 1.60. The regression analyses showed a positive association between presence of at least one adult with hypertension and child SBP ($\beta = 0.142$, $p = 0.007$) and between presence of at least one adult who is overweight and child BAZ ($\beta = 0.155$, $p = 0.006$), controlling for household income and sex of child.

Table 1: CONCAR Sample Characteristics	
Participants in Sample	916
Households in Sample	158
Adults in Sample	600
Children in Sample	316
Average Age of Adults	40.5 years
Average Age of Children	12.6 years
% Male Adults	40.1%
% Male Children	50.5%

Table 2: Hypertension and Overweight Statistics	
% Adults Hypertensive	20.3%
% Adults Overweight	51.4%
% Households with Hypertensive Adults	50.6%
% Households with Overweight Adults	82.6%
Average SBP of Chldren	104.45 +/- 12.55
Average BAZ of Children	-0.74 +/- 1.60

Conclusions

Adult hypertension was associated with higher systolic blood pressure in children and adult overweight status was associated with higher BAZ in children within the same household. These findings further strengthen the case for intergenerational transmissibility of cardio-metabolic risks, and how these relations relate between adults and children within the household. From a primary care and primary prevention perspective, noting the disease state and risk factor status of adults in the household may inform preventive care for children in the household

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