Evaluating the relationship between protective factors and hypertension in a cohort of Indigenous youth

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Introduction

- Truth and Reconciliation Commission of Canada Calls to Action #19: *Report health disparities to close gaps in health outcomes.*
- Prevalence of hypertension (HTN) in Indigenous Australian youth ages 5 – 17 is 27%, much higher than reported pooled prevalence of 4% in the general pediatric population.
- Strength based approach: Few studies on psychosocial and behavioral protective factors in addition to risk factors.

Aims

1. Understand the prevalence of HTN in an Indigenous cohort of youth from Manitoba.

2. Analyze the association between biopsychosocial variables and hypertension (HTN).

Hypotheses

1. Biomedical risk factors are associated to development of HTN in this cohort of youth.

2. Psychosocial and behavioral factors protect against the development of hypertension in youth.

Methods

- Cross-sectional study from the improving renal Complications in Adolescents with type 2 diabetes through REsearch (iCARE) cohort
- Inclusion criteria: Controls (no diabetes) ages 10-25 years
- Exclusion criteria: Non-Indigenous self-identification and lack of blood pressure data available

Exposures:
- **Psychosocial and behavioral factors** – perceived stress (PSS14), social support, food security, resilience and physical activity
- **Biological markers** – BMI z-score, total cholesterol, triglycerides, HDL, LDL, ALT, HbA1c, urine albumin:creatinine ratio (ACR), estimated glomerular filtration rate (eGFR) and CRP
- **Demographic covariates** - age, sex, geographic location, income quintile

Primary outcome: Hypertension (HTN)

HTN criteria:
- Phase 1: 24-hour Ambulatory BP monitor (ABPM) – Daytime or nocturnal bp $\geq$95th%ile+bp load $\geq$25% (sex and height-based norms)
- Phase 2: BpTRU (average of 5 readings) $\geq$95th%ile (age, sex, height-based norms or $\geq$130/80 for 13+ years ;AAP guideline criteria)

Statistical Analyses:
- Descriptive statistics to describe characteristics of adolescents with and without hypertension.
- Linear regression analyses with continuous outcomes:
  - 1. Mean Daytime Systolic Blood Pressure
  - 2. Mean Daytime Diastolic Blood Pressure

Results

Table 1: Descriptive characteristics of the participants with hypertension and without hypertension at baseline.

	Normal Blood Pressure (N=75)	Hypertension (N=34)	Overall (N=129)	P - value
Demographics				
Age	13.4 [9.54, 24.4]	15.0 [9.31, 23.1]	14.4 [9.31, 24.4]	0.08
Sex				
Female	41 (54.7%)	19 (55.9%)	70 (54.3%)	0.91
Male	34 (45.3%)	15 (44.1%)	59 (45.7%)	
Location				
Rural	55 (73.3%)	24 (70.6%)	93 (72.1%)	0.77
Biological factors				
BMI z - score	3.27 (0.256)	3.25 (0.245)	3.28 (0.275)	0.62
ALT	19.0 [10.0, 74.0]	26.0 [9.00, 162]	21.0 [9.00, 162]	0.03
HbA1c %	5.49 (0.273)	5.66 (0.274)	5.54 (0.300)	0.004
eGFR (ml/min/1.73m²)	121 [89.2, 179]	131 [94.3, 222]	125 [89.2, 222]	0.02

Table 2: Prevalence of HTN in youth with ABPM and BpTRU measurements.

Phase 1 (ABPM criteria)		Phase 2 (AAP criteria)		Overall (combined)	
Hypertension	21 (38.9%)	Hypertension	13 (22.0%)	Hypertension	34 (26.4%)
Day	2 (3.7%)	Stage 1	8 (10.7%)	Normal BP	75 (58.1%)
Nocturnal	9 (16.7%)	Stage 2	5 (8.5%)		
Both	10 (18.5%)				

Table 3: Univariate linear regression analysis evaluating associations between daytime systolic BP and biological and psychosocial factors.

	Estimate	P - value	95% lower limit	95% upper limit
Age	1.17	0.001	0.50	1.84
Biological factors				
Triglycerides	3.24	0.03	0.35	6.13
Low density lipoprotein (LDL)	5.95	0.005	1.90	9.99
ALT	14.48	< 0.0001	6.95	22.01
HbA1c %	0.23	< 0.0001	0.14	0.33
eGFR	0.26	< 0.0001	0.18	0.34
Inflammatory marker (CRP)	1.23	0.002	0.48	1.99
Psychosocial factors				
Moderate Food Insecurity	-9.49	0.001	-14.85	-4.13
Perceived Stress Scale	5.19	0.027	0.66	9.73

Results

Table 4: Univariate linear regression analysis evaluating associations between daytime diastolic BP and biological and behavioral factors.

	Estimate	P - value	95% lower limit	95% upper limit
Biological factors				
Triglycerides	2.71	0.011	0.66	4.76
LDL	5.44	< 0.001	2.63	8.26
ALT	0.10	0.005	0.032	0.17
HbA1c %	9.75	< 0.0001	4.49	15.01
eGFR	0.096	0.003	0.034	0.16
Behavioral factors				
Vigorous MET-hrs	-0.048	0.047	-0.093	-0.002

BP Measurement Devices

Fig. 1: ABPM cuff.

Fig. 2: BpTRU cuff.

24-hr ABPM
- Day – readings every 20 min
- Night - every hour
- ABPM criteria

BpTRU
- Average of 5 serial readings
- AAP Criteria

Conclusions

Key findings:
- Indigenous youth with high BMI → High rates HTN
- Youth with HTN → Higher markers of metabolic syndrome
- Higher food security and lower stress levels → Lower SBP
- More vigorous-MET hours → Lower DBP

Significance:
- Youth were found to have HTN based on a research study protocol which emphasizes the need for access to early screening.
- Protective nature of low levels of stress, vigorous exercise and food security can be an important target to improve health outcomes and drive systemic change in affected communities.

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