Association of physical activity with insulin resistance

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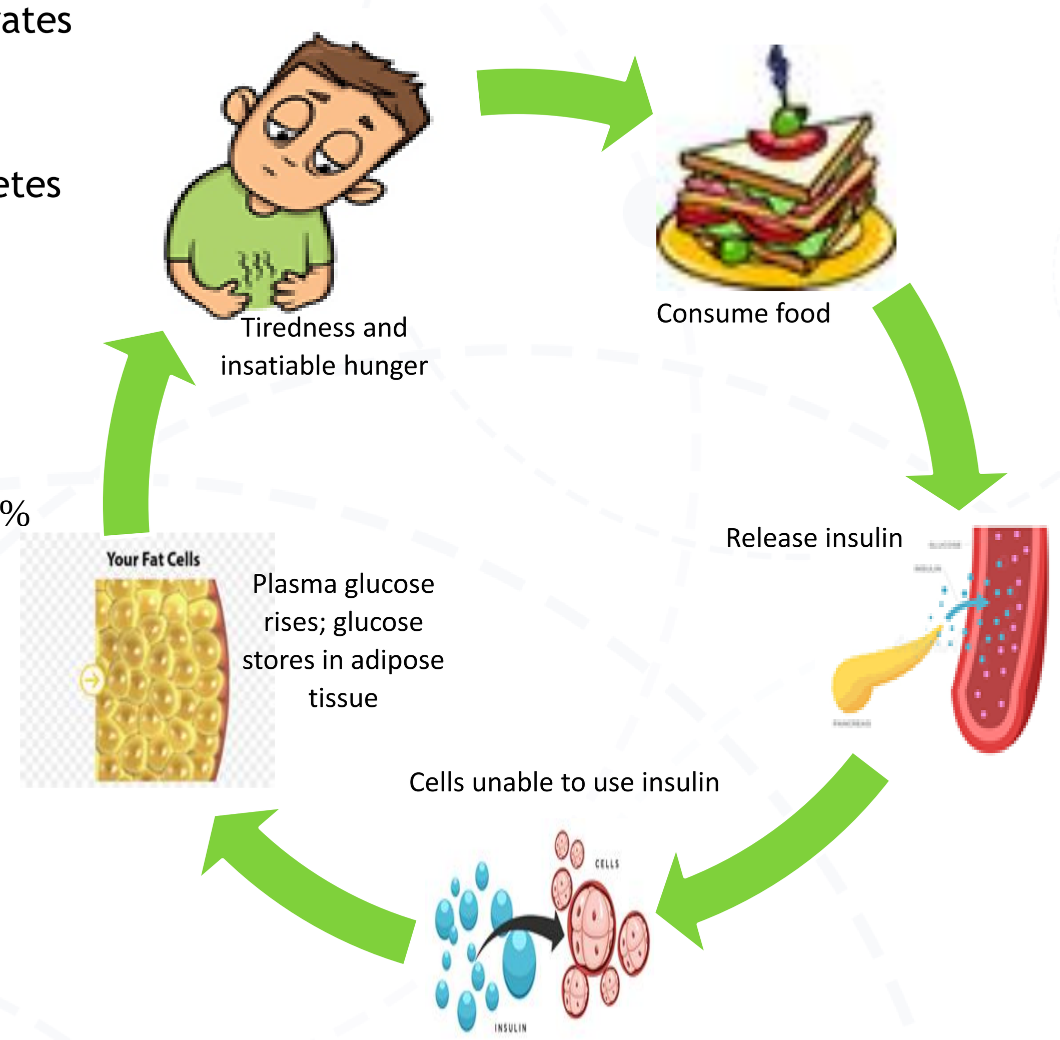
BACKGROUND

Insulin resistance (IR)

- Refers to cells inability to effectively use insulin produced by pancreas.
- Results in obesity and diabetes.
- Risk factors include:
    - diet high in carbohydrates
    - gestational diabetes
    - conditions like PCOS
    - family history of diabetes
    - smoking
    - ethnicity
    - age
    - obesity
    - physical inactivity
- Prevalence ranges from 15.5 to 46.5%
- Information is scanty in rural SA



Physical activity (PA)

- Refers to any bodily movement that requires energy expenditure and engages your muscles.
- Sufficient PA has been shown to reduce risk of cardiovascular disease (CVD).
- Benefits of regular PA include:
    - Improved Insulin Sensitivity
    - Enhanced Glucose Uptake
    - Reduced Fat Accumulation
    - Inflammation Reduction
    - Improved Muscle Function
    - Increased release of adiponectin, which has insulin-sensitizing effects
- Prevalence of physical inactivity ranges from 43 to 49% in South Africa
- In this study population, it was estimated to range between 67.3 and 71.0%

Rationale for study

- Physiological mechanism of PA on CVD is multifarious; more evidence on such associations is imperative.
- Studies of this nature are scanty in developing countries, especially in rural populations.
- Young adulthood is a stage of transition from childhood (where PA is not very low) to adulthood (PA is very low in this stage); targeting this age group may help reduce the risk of CVD in adulthood.

OBJECTIVES

Objectives of the study are to:

i. Assess PA status of the study sample
ii. Assess prevalence of insulin resistance
iii. Assess the association between PA and IR

METHODOLOGY

670 participants aged 18 to 28 years

All signed informed consent

Physical activity

International Physical Activity Questionnaire (IPAQ) was used to collect data on work, leisure and travel for both weekdays and weekends

Metabolic equivalents per minute (MET-minutes) were derived by multiplying number of activites by number of days per week

IPAQ cut-off points were used to classify PA as either inactive, minimally active or sufficiently active

Inactive (<600 MET-min/week), moderately active (600–1500 MET-min/week) and sufficiently active (≥1500 MET-min/week)

IPAQ International Physical Activity Questionnaire

Fasting blood samples collection

Participants fasted 8–10h before blood collection

Collection done by registered nurse

Samples placed into cooler box with ice on site

Samples were later transported to laboratory, where they were centrifuged and serum stored at –80°C

Blood analysis

Glucose and insulin were analysed using Access 2 immunoassay and AU480 autoanalyser, respectively.

Insulin resistance

IR was calculated using the HOMA-IR: fasting glucose (mmol/L) X fasting insulin (µU/L) / 22.5

American Diabetes Association (2015) cut-off points were used to define IR as HOMA-IR score ≥2.5 µU/L

Statistical analysis

IBM SPSS was used for all analysis; statistical signifacance set at $p < 0.05$

Descriptive statistics were reported by gender for levels of PA, glucose and IR; frequency analysis done for prevalence of inactivity and IR

Linear regression assessed the relationship between PA and glucose and insulin levels

Logistic regression assessed the odds of having IR with low PA

Both tests were done unadjusted as well as adjusted for family history of diabetes, age, gender, obesity indices and dietary intake

RESULTS

- The levels of glucose and insulin resistance were significantly lower in males (5.56 mmol/L vs 5.75 mmol/L and 2.10 µU/mL vs 2.89 µU/mL) compared to females, and the level of PA was low in females (538.65 MET-min/week vs 670.34 MET-min/week).
- The prevalence of physical inactivity (63.9% males; 67.7% females) and IR (22.9% males; 29.3% females) were significantly higher in females than in males.

Table 1: Prevalence of IR stratified by PA

PA level		HOMA-IR≥2.5 µU/L
Inactive (<600 MET-min/week)	<2.5	61.90%
	≥2.5	38.10%
Minimally active (600 - 1500 MET-min/week)	<2.5	77.00%
	≥2.5	23.00%
Sufficiently active (≥1500 MET-min/week)	<2.5	82.60%
	≥2.5	17.40%

- Linear regression showed a significant relationship between PA and glucose (ß= 5.715; 95%CI 4.545-6.885; p=0.000), IR was NOT significantly associated with PA after adjusting for confounding factors (ß= -1,793; 95%CI -13,088-9,501; p=0,755).
- Logistic regression showed that PA increases the chances of abnormal HOMA-IR values(OR=1.755 95%CI 1.226-2.513; p=0.01) .

CONCLUSIONS

- Low level of PA in this population presents the participants with increased chances of IR.
- The absence of association between PA and IR after adjusting for confounders is evidence that multiple factors collectively contribute to IR.
- This study provides evidence for a need for a study that combines multiple lifestyle factors that contribute to the development of IR.

ADVOCACY MESSAGE

Every year, thousands of people die or suffer from insulin resistance-related diseases that can be managed or prevented by lifestyle adjustments. Now is the time to take the scientific evidence to the public, in order to implement intervention strategies that will help people make the necessary adjustments to their everyday lives in order to prevent insulin resistance.

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