

PREDISPOSITION TO DEVELOP INSULIN RESISTANCE IN MILITARY POLICE

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Abstract

In this study, we aimed at estimating how the predisposition to insulin resistance (PIR) prevails, by using waist circumference (WC) for a group of military police (MP). This is a transversal study, performed with a sample of 316 PM, consisting of (a) dependent variable: PIR, assessed by WC; (b) covariates: age, marital status, habitual physical activity level (HPAL), length of service, university degree, police function. The results showed 37 % of sedentary or irregularly active MP. For the gross analysis, the PIR was more prevalent among the older MP and sedentary or irregularly active MP. The older PM also showed higher degree level and length of service. After the adjustment by multiple logistic regression, only the age and HPAL remained linked to PIR among the MP.

Keywords: Waist Circumference - Insulin Resistance - Military Police - Anthropometry

Introduction

The abdominal obesity, usually assessed by the waist circumference, have associated relevant relations with HTN, NIDDM, and metabolic syndrome; diseases hugely expensive for public authorities yearly, due to morbidity and mortality (ABEGUNDE; STANCIOLE, 2006).

Today, the importance of obesity as a public health problem comes from studies that consider adipocytes as fundamental to organs with endocrine and metabolic activity. In addition, such adipocytes go beyond helping the tissue by storing energy (BARROSO; ABREU; FRANCISCHETTI, 2002).

Associating metabolic disorders with abdominal obesity, thus, is weightier than with fat in other regions of the body (BARROSO; ABREU; FRANCISCHETTI, 2002; WANNAMETHEE et al., 2005).

Hence, researchers accept, also other questions, hyperinsulinemia as linked to the HTN source for obese people (HAFFNER; MITCHELL; STERN, 1991).

The waist circumference (WC), in general, is important on distributing the body fat. Indirectly, it assesses the visceral fat deposition and is pointed out as the more apt anthropometry to predict cardiovascular risk (HAN et al. 1995; PITANGA; LESSA, 2005) and NIDDM (FREEMANTLE et al., 2008). This occurs due to sundry features, e.g. the WC is both easy to obtain and a single measure, lessening the assessment level (LEMIEUX et al., 1996).

In this wise, a study including Brazilian adult men (VASQUES et al. 2009) showed a strong WC–HOMA-IR rate and a capacity to discern insulin resistance, requiring a cut-off point of 89.3 cm.

In the case of no direct method to assess the insulin resistance, the use of WC means an option, in particular for practical and accessible epidemiologic studies.

In this study, thus, we aimed at investigating the predisposition to develop insulin resistance in a group of MP. To do so, we used WC with cut-off point, suggested by Vasques et al. (2009).

Methods

This is a cross-section study with a group of MP from the First Military Police Battalion in Feira de Santana¹. It consists of a centre to train soldiers, which is reference for other units within the state of Bahia. Nowadays, it is divided into six companies with 1,095 police, and 901 of them are men.

The sample was build randomly by using probability–sampling method by correcting it for a finite population, and for the sample calculation, we used the parameters: estimated prevalence for the studied event (12.9 % for abdominal fat (OLIVEIRA et al., 2009); statistical significance level (5.0 %); estimation error accepted for prevalence (3.6 %); and quantity of subjects from reference population (901). Thus, the calculated sample was 244, but with data from 252 MP.

The following formula was used for the sample calculation:

1-Feira de Santana is the second most important city in the State of Bahia, Brazil, with over 700 000 inhabitants (IBGE, 2006).

$$n_0 = \frac{z_{1-\alpha/2}^2 p(1-p)}{\epsilon^2}$$

In which: $p = 12.9\%$; $z_{1-\alpha/2}^2 = 1.96$, for the interval of 95 % for confidence, or level of 5 % for significance; $\epsilon^2 = 3.6\%$. After calculating n_0 , the correlation for a finite population was used, according to the following formula, in which $N = 1095$.

$$n = n_0 \times \frac{N}{n_0 + (N - 1)}$$

The dependent variable was the predisposition to develop insulin resistance, assessed by WC and choosing cut-off point of 89.3, proposed recently for men ((VASQUES et al., 2009). Only one responsible person assessed the WC, i.e. an assessor previously trained, in the mean point between iliac crest and last rib (WORLD HEALTH ORGANIZATION, 2000), with a flexible, inextensible acrylic tape measure with 2 m in length (Cardiomed®). The measure was performed in triplicate, by using parameter arithmetic mean for the data analysis.

The covariates we obtained from a structured questionnaire were:

(a) sociodemographic: age and marital status, (b) behavioural: HPAL, and (c) involving professional activity: length of service, university degree, and police function.

By applying the IPAQ (International Physical Activity Questionnaire) (short version), we investigated the HPAL and classified it as the weekly and time frequency criteria, considering: sedentary, irregularly active, active, and very active.

All data was collected in the First Military Police Battalion, from July to August 2009, from 06.00 to 09.00; moment when MP get together to take their equipments, patrol cars and receive their services, as the day choice.

This study complies with the Resolution No 196/96 of the National Health Council, concerning the researches performed with human being, with the approval of the Research Ethics Committee of the State University of Feira de Santana, with the protocol No 056/2009. All subjects started taking part indeed after their signature on the Free and Clarified Consent Term.

The information on the study variables were typed and stored in a

database of the SPSS (Statistical Package for Social Sciences) for Windows OS, version 10.0. We split up the data analysis into three stages. In the first, we described the variables, assessing measurements and occurrence (prevalence) for the qualitative variables. In the second, the measurements for statistical (chi-square) and association (prevalence ratio) significance were calculated, choosing the 5 % for significance level.

In the third, we assessed the structured variables simultaneously, by using exploratory multiple logistic regression, by backward method, with the significance criterion $p < 0.10$ to obtain the final model. The variables with statistical significance in the bivariate analysis until 0.25 were pre-selected for regression (HOSMER; LEMESHOW, 2000).

The prevalence rate (PR) and respective confidence interval for the final model obtained were estimated based on Delta Method (OLIVEIRA; SANTANA; LOPES, 1997), by using the statistical package R 2.10.1.

Results

The study sample is in the table 1. The table 2 shows that most MP investigated are single, aged 30–40, with low degree level, and with operational function (ostensible policing). Most volunteers are police over 10 years (161 police or 63.9 %) The HPAL assessment revealed that 9.1 % of police are sedentary and, 28.2 %, irregularly active. In total, 37.3 % of police presented low level for physical activity.

The predisposition to develop insulin resistance occurred in 31.0 % of police (i.e. 78 MP with WC over 89.3 cm). For gross analysis, the PIR prevailed more for police aged over 40 years ($p = 0.003$), with higher degree level ($p = 0.02$) and longer length of service ($p = 0.042$). Moreover, the low HPAL also was linked to the PIR among the volunteers studied. Such subjects exhibited PIR predominance 1.5 times higher, as the low HPAL ($p = 0.03$) (table 3).

In this study, according to our aim and statistical criteria, the following covariates were pre-selected for analysis by multiple logistic regression: marital status (ms), age, HPAL, university degree (ud), and length of service in the police (lsp).

By comparison and statistical significance criterion choice, the final model obtained did not preserve the covariates marital status and

police degree and police length of service, achieving the equation: Logit (PRI) = $\beta_0 + \beta_1 id + \beta_2 nhaf$.

Considering $p < 0.05$, the results for the multiple logistic regression analysis showed two variables linked to predisposition to develop insulin resistance among MP, namely, age and HPAL (table 4).

Table 1: Sample description

	limit	limit	mean	standard deviation
age (years)	20.00	54.00	36.98	5.77
waist circumference (cm)	66.00	114.00	85.95	8.95
MP length of service (years)	1.00	29.00	13.41	6.73

Table 2: Features involving society, behaviour, and linked to MP professional activity

variable	MP qty	%
marital status (n=252)		
single	56	22.2
married	178	70.6
divorced	12	4.8
separated	3	1.2
widowed	3	1.2
age (n=252)		
<30	25	9.9
30–40	150	59.5
>40y	77	30.6
police degree (n=252)		
soldier	208	82.5
sergeant	33	13.1
sub-LT*	2	0.8
LT	8	3.2
captain	1	0.4
police degree (n=252)		
operational (ostensible policing)	210	83.3
administrative	42	16.7
length of service (years) (n=252)		
0–5	34	13.5
6–10	57	22.6
11–20	123	48.8
>20	38	15.1
HPAL (n=252)		
sedentary	23	9.1
irregularly active	71	28.2
active	96	38.1
very active	62	24.6
risk of insulin resistance		
present	78	31.0
absent	174	69.9

*LT: abbreviation for lieutenant.

Table 3: Predisposition to develop insulin resistance among MP, as sociodemographic and behavioural features

variables	MP total	PIR MP qty	%	PR (CI95%)	p- value
marital status (n=252)					
married	196	66	33.7	1.57 (0.92-2.69)	0.081
not married*	56	12	21.4		
age (n=252)					
Until 40	175	44	25.1	1.76 (1.23-2.51)	0.003†
>40	77	34	44.2		
police degree (n=252)					
soldier	208	58	27.9	1.63 (1.10-2.41)	0.02‡
sergeant, sub-LT, LT, captain	44	20	45.5		
police degree (n=252)					
operational	210	63	30.0	1.19 (0.76-1.88)	0.46
administrative	42	15	35.7		
length of service (years) (n=252)					
0-10	91	21	23.1	1.53 (1.00-2.36)	0.042‡
>10	161	57	35.4		
HPAL (n=252)					
sedentary, irregularly active	94	37	39.4	1.52 (1.05-2.18)	0.03‡
active, very active	158	41	25.9		

†p<0,01. ‡p<0,05. *including single, separated/divorced, and widowed MP.

Table 4: The adjusted PR and the CI (95 %) between sociodemographic features and PIR, from multiple logistic regression model.

covariate	PR	CI95 %
Age (>40)	1.79	1.25-2.56‡
HPAL (sedentary / irregularly active)	1.56	1.07-2.27‡

‡p<0,05.

Discussion

One can define the insulin resistance as a tissue response for insulin action lower than what expected, with normal hormone concentration (MENDVIL, 2005; GELONEZE; TAMBASCIA, 2006).

In this study, the predominance of 31 % of MP with predisposition to develop insulin resistance point up risk of NIDDM, HTN, and other cardiovascular diseases, present among the PM of Feira de Santana.

The predominance of sedentaries, adversely, was low (9.1 %) and lower than the estimate for men in the Brazilian population (29.5 %) (BRASIL, 2009). Such data agrees with the MP service features, which demands from professionals minimum levels for physical aptitude; for the good performance concerning ostensible policing and maintenance of public order. The predominance of sedentariness for the MP

studied was even low than what was presented in other study with MP from the State of Mato Grosso in Brazil (27.35 %) (DOMINGUES, 2003).

When we grouped the sedentary MP with the irregularly active MP, we observed that 37% of MP was low physical-activity level, which is a result higher than what was found among men in an urban population from the southeast region of Brazil (28 %) (EYKEN; MORAES, 2009).

Practising habitually physical activities has been linked to sundry benefits to public health (HASKELL et al., 2007), showing positive results to prevent and treat diseases. In general, this is why it appears in the national and international recommendations to treat and prevent important chronic degenerative diseases, e.g. HTN², diabetes³, obesity⁴, and metabolic syndrome⁵.

For the gross analysis, HPAL, age, university degree, and police length of service associated with PIR among the MP studied. After the logistic regression adjust, however, the association for police degree and police length of service with the PIR was not considered.

Such result significantly shows appropriate levels to practise habitually physical activities; therefore, physical aptitude to build an appropriate biochemical profile among MP. Bear in mind that the physical aptitude, particularly the cardiorespiratory, can be important to control the biochemical variables, e.g. lipoproteins and blood sugar (SILVA et al., 2006).

Contrastively, linking the growth in physical aptitude, provided by regular practice of physical activities, to the increase of muscle mass and decrease of total and visceral BF is important. Thus, this can mean effective measures to control risks of metabolic complications (STEWART et al., 2005).

In this wise, a study performed in Londrina showed that the cardiorespiratory physical aptitude per se do not help to lessen associating central fat distribution with HOMA-IR rate in a group of employees

2-PESCATELLO et al., 2004.

3-SOCIEDADE BRASILEIRA DE DIABETES, 2008; ALBRIGHT et al., 2000.

4-JAKICIC et al., 2001.

5-I DIRETRIZ BRASILEIRA DE DIAGNÓSTICO E TRATAMENTO DA SÍNDROME METABÓLICA, 2005.

6-Londrina is a city in the northern region of the state of Paraná, in Brazil.

(men and women) from Embrapa (Brazilian Enterprise for Agricultural Research). However, the results suggested a weighty impact for cardiorespiratory aptitude regarding the association of central fat distribution with fat metabolism and arterial pressure levels, primarily for men (SILVA et al., 2006).

Nevertheless, obvious facts indicate lower levels of insulin, higher insulin sensitivity, and higher protection against decline for glucose tolerance, with athletes' aging compared to sedentary subjects. We also strengthen the need to practise physical exercises regularly, bearing in mind the effort over the insulin sensitivity (from 12 to 48 hours after the session) (CIOLAC; GUIMARÃES, 2004).

In no way we were surprised by having found more PIR among the older MP in this study, since the age have been pointed as high risk for non-transmissible chronic disease.

For other risks, in fact, the population aging is an important matter linked to the growth rate respecting predominance of NIDDM in Brazil (SARTORELLI; FRANCO, 2003).

For the active MP, by contrast, being older can also mean a longer length of service and more time in life-risk situations, experience of violence and death, which causes stress (COSTA et al., 2007). Further, if one links it to the low level of physical activity, it can be linked to the formation of several chronic morbidities for such labourers.

One of the main limits for this study was the lack of information on MP's morbid profile, preventing it from relating PIR estimate with predominance of diabetes mellitus, HTN, and other metabolic and cardiovascular diseases. To contribute to new analysis, there is also information on morbid family antecedents and MP's food habits.

Other limit is the lack of study comparable to MP in Brazil (SCHLICHTING; SILVA, 2009).

Paradoxically, we stress that the analysis results for prevalence ratio regression allowed us to correct the overestimation trend from odds ratio.

Considering the lack of more authentic diagnosis methods, the use of WC to indicate predisposition to develop insulin resistance (and, hence, NIDDM) set up other choice to assess population's health profiles. However, such use must be careful, even if one understands how important is to reduce the abdominal fat in the first intervention for health promotion policies.

Conclusion

In conclusion, the prevalence of PIR development among MP investigated was 31 %. The age and HPAL was important for the PIR among this study volunteers. In such reality, one clearly can see that only the HPAL can suffer changes. Concerning all health benefits from regularly practising physical activities, it would be better to create an institutional policy to encourage MP adopting a more active lifestyle. Thus, they could have better conditions to practice physical activities regularly, with professional help and safety.

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