

ARTÍCULO

Descriptive study on cardiovascular risk and obesity level on DUOC UC[†] Students

MSc. Marcelo Venegas A.^{ab} MSc. Hernán Salinas M.^{ab}; Lic. Mario Núñez L.^a; Prof. Muricio Tapia Z.^a; MSc. Manuel Gallardo V.^a; MSc. Cristian Molina P.^a y MSc. Marta Miro M.^{ab}

^a Duoc UC Institute, School of Health. Santiago de Chile. Chile.

^b Club Deportivo Universidad Católica. Santiago de Chile. Chile.

[†] Project financed by the School of Health, Duoc UC.

Autor para Correspondencia: Marcelo Venegas A. Duoc UC, Av. Concha y Toro 1340 c/San Carlos. Puente Alto. Chile. Email marcelovngs@gmail.com Teléfono +56 9 6676 3465

Recibido el 20 de agosto de 2018 / Aceptado el 23 de noviembre de 2018

Abstract

Seventeen million people died worldwide from cardiovascular disease in 2000. (Velazquez-Monroy et al., 2003) Today, that value is increasing. There are anthropometric measurements related to adiposity, body perimeters and ratios relating height and body weight, that can be used to predict the cardiovascular risk level and cardiovascular mortality in adults (Koch et al., 2008). The nomogram for Chilean adults proposed by Koch et al. (2008), which uses the Waist Circumference–Height Ratio, was used to establish cardiovascular risk level. Besides, the level of obesity has been established using the Body Mass Index.

The aim of this study is to describe the level of cardiovascular risk by means of Waist Circumference–Height Ratio and the level of obesity by means of the Body Mass Index of DUOC UC students. A total of 760 evaluated

students shows an average Waist Circumference–Height Ratio of 0.48 ± 0.05 and an average Body Mass Index of 24.47 ± 3.49 . According to the nomogram, it was observed that 70% of the students fall on a low level of cardiovascular risk, 20.4% on a moderate level and 9.6% on a high level. Regarding Body Mass Index, it is observed that the average for the total sample of 24.47 ± 3.49 which is categorized as Healthy.

Keywords: Body mass index, Cardiovascular Risk, Risk factors, Waist to height ratio.

Introduction

Body composition estimation is a shared interest among diverse areas such as nutrition, medicine, anthropology, sports science, among others and it directly affects different types of population, adults and school aged. Its importance lies on the fact

that, evaluating body composition could play an important role for the diagnosis of diseases related to risk factors for health. (Corvos, 2011).

Cardio vascular diseases (CVDs) are considered the main cause of death and disability worldwide. In spite of the decrease of deaths in developed countries, CVD's indexes have been growing enormously in the last decades (Michelotto, Martins, Machado, Santos, & Carvalho, 2010). There are several intervening factors currently under constant observation, sedentary lifestyle and obesity among them.

In 2000, estimations indicated that around 17 million people died due to CVD worldwide, that a coronary event occurs every 4 seconds and a cerebrovascular event occurs every 5 seconds (Velázquez-Monroy et al., 2003). Studies indicate that in Spain, in the past decade, there were more than 125,000 deaths and more than 5 million hospital stays due to CVD per year. The increase of obesity in many countries and its consequences on human health has led international organizations to be alert. Back in 1997, World Health Organization (WHO) already included obesity among epidemics, considering it a complex disease influenced by different types of factors (Carmenate Moreno, Marrodán Serrano, Saturnino Table, Montero De Espinosa, & Alba Díaz, 2007).

In Chile, in 2002, CVDs were established as the leading cause of death, with rates of around 28% (Bustos, Amigo, Arteaga, Acosta, & Rona, 2003). In 2013, this percentage increased by 9%, since nutritional and metabolic diseases were added (INE Chile, 2015). In 2014, through the SIMCE test for physical education, 9919 eighth graders from 370 schools were tested, and the results show that 20% have CVR or metabolic risk and 41% suffer from obesity or are overweight (MINEDUC, 2015).

There are several tools to assess the development of overweight and obesity, however to be able to establish the level of

CVR, relative indexes must be used. (Carmenate Moreno et al., 2007). Body mass index (BMI) is an indicator of the level of obesity, but it requires other indicators to be related to CVR. Several studies correlate BMI and waist circumference (W) (Ojeda & Cresp, 2011), others establish that waist circumference–height ratio (WHtR) is a better index to asses CVR of an individual, by the use of a nomogram. (Figure 1) (Koch et al., 2008)

This study describes the level of cardiovascular risk by means of WHtR and the level of obesity by means of the BMI of DUOC UC students, from the two physical activity related programs, Physical Training Technician (PTT) and Physiotherapy Technician (PT) from the campuses in Maipú, Puente Alto, San Bernardo and Viña del Mar.

Materials and methods

Methods

Weight, height and waist circumference measurements were taken according to the protocols established for the assessment of body composition for medical and sports examination by the Spanish Federation of Sports Medicine (Alvero et al., 2009) and the approved material for this type of study was used.

- Body Weight: It was measured with a balance of weights. Men were measured wearing underwear and women wearing sports underwear.

- Height: A stadiometer equipped with a scale and a sliding horizontal headpiece was used to measure maximum standing height. Subject's position was: heels together, buttocks and upper back resting on the scale of the stadiometer.

- Waist Circumference: The tester placed in front of the subject. Measurement was taken at the narrowest point level between the 12th rib and the iliac crest, using an anthropometric tape. If it was not

apparent, the reading was taken at midpoint between the two marks. The measurement was made at the end of a normal expiration, with the arms relaxed hanging by the sides of the torso.

- Waist circumference–height ratio Nomogram: From the measures above, WHtR was calculated and used as input to establish CVR by using the nomogram proposed by Koch et al., in 2008 (**¡Error! No se encuentra el origen de la referencia.**).

- Body Mass Index: This index was calculated using the expression:

$$. BMI = \frac{body\ mass\ (Kg)}{height\ (m)^2}$$

Then, categories according to BMI were established using the following table: (**¡Error! No se encuentra el origen de la referencia.**) (Health, 1998).

Sample Description

The sample consisted of 760 students (520 men and 240 women) (Table II) with an average age of 22.02 ± 3.68 years. 68.42% of the students were men and 31.57% were women. 583 students were from the PTT program and 177 students from the PT program, all from the Duoc UC campuses where these programs are taught. The distribution of participants by campus was: Viña del Mar 242 students, Puente Alto 197 students, San Bernardo 95 students and Maipú 226 students. (Table III)

Every student signed an informed consent letter before participating in the study.

The investigation was realized considering and respecting the totality of the " Ethical Beginning for the Medical Investigations in Human Beings " of the Declaration of Helsinki, done by the Medical World, Association except by the point 23, in which is indicated the need of approval of a Committee of Ethics of Investigation. The reason of this, it is that the scientific

investigation is a new area in the Institute DUOC, for what the institution, still it has not shaped the above mentioned committee, nowadays in process of creation. Nevertheless, the investigation possesses the approval and the sponsorship the Direction of the School of Health.

Statistical Analysis

Data registration and graphic analysis were made with the Microsoft Office Excel 2015 software. Descriptive statistical analysis was done with the SPSS-v21 software. BMI values are presented as mean values and standard deviation (mean $\pm$ SD).

Contingency tables for gender, campus, program and year of study were used to describe the sample. Absolute and relative frequencies of CVR were calculated for all the descriptive variables.

Results

Cardiovascular risk

First, by observing absolute and relative frequencies according to the nomogram used, it was found that there were 532 students at the low level of CVR, 155 students at the moderate CVR level and 73 students at the high CVR level. (Table III). These results, expressed by percentages, show that 70.77% of men and 68.33% of women are in the low risk level, while 13.33% of women show a high risk of CVR. (**¡Error! No se encuentra el origen de la referencia.**).

CVR frequencies by Campus (Table IV) were also studied and Maipú showed the largest percentage of students at the low level of CVR (75.22%), Viña del Mar showed the largest percentage of students at the moderate level (22.31%), and Puente Alto presented the greatest percentage at the high level of CVR (19.29%). (Figure III)

Regarding programs, it was found that, in PTT, there were 428 (73.41%) students at the low level of CVR,. In the PT program, there were 104 students (58.76%) at the low level of CVR, 40 students (22.60%) at the moderate level and 33 students (18.64%) at a high level of CVR. (Table V) (Figure IV).

Obesity Level

Mean BMI was calculated for all groups, (Table VI) which allows establishing obesity levels of each group (Table VII).

The mean BMI value of the sample was 24.47 ± 3.50 is considered Healthy. When the sample was separated by gender, men were found to have a mean BMI of 24.52 ± 3.22 and women a mean BMI of 24.36 ± 4.05 . Both values considered in the Healthy category. When the sample was studied by Campus, the lowest BMI was found in San Bernardo (24.14 ± 2.95) and the highest was found in Puente Alto (24.75 ± 3.96).

Analyzing by gender and campus, it was found that the lowest mean BMI belongs to the group of women from Maipú (23.71 ± 3.50) and the highest mean BMI belongs to the women from Puente Alto (25.11 ± 4.33). Among men, the lowest mean BMI was found in San Bernardo (24.18 ± 3.00) and the highest in Maipú (24.86 ± 3.02).

Analyzing by gender and program, it was shown that men from the PTT program, have a mean BMI of 24.52 ± 3.11 , while men from the PT program have a mean BMI of 24.52 ± 3.96 . Regarding women, the PTT program shows a mean BMI of 23.41 ± 2.79 and the PT program a mean BMI of 25.43 ± 4.90 , which places this group in the overweight category.

When analyzing by gender, program of study and campus, it is shown that PTT's students from San Bernardo have the lowest mean BMI among men with 24.18 ± 3.00 and that

PT's students from Maipú have the highest mean BMI with 25.27 ± 3.01 , which puts the later in the overweight category. For women, the lowest mean BMI was 22.74 ± 2.46 and found in PTT students from Maipú while the highest mean BMI was 25.99 ± 4.51 , found in PT students from Maipú. This last figure puts this group in the Overweight category.

Discussion and Conclusion

It was described in this study, that approximately 30% of young adults from DUOC UC physical activity related programs have some level (high or moderate) of cardiovascular risk. This percentage is even greater among students from the PT program, probably influenced by the fact that this program does not include as much physical activity in its curriculum as the PTT program does. Data disaggregated by Campus shows that fewer than 30% of students from Viña del Mar, Maipú and San Bernardo have some level of CVR. On the other hand, it was found that in Puente Alto, this percentage goes as high as 40%, with 20% in the high risk level. These figures suggest that healthy lifestyle habits such as regular physical activity and healthy diet are yet to be acquired.

Considering that the city of Viña del Mar presents better conditions for outdoor and physical activities, it was expected to find differences between students from that city and those from Santiago (Maipú, Puente Alto and San Bernardo) but data shows no significant difference. It should be noted that public policies for the promotion of physical activity and health are the same for the whole country, and that programs are usually implemented and run by municipalities, therefore there are differences among towns even within the same region.

Data disaggregated by Gender, show a percentage of women in the high and

moderate risk categories slightly higher than that of men (31,66% and 29,23%, respectively). This was previously noted in other CVR studies carried out in Chile on young adults. (Bustos et al., 2003).

The sample as a whole and all but three groups fall in the Healthy category according to their mean BMI, but in most cases these values are very close to the upper limit, which suggests that, if actions are not taken, mean BMI values could perfectly fall in the Overweight category in the near future.

According to these results, it is necessary to continue researching about CVD risk factors and to implement preventive actions to encourage students to acquire healthy nutritional and physical activity habits, getting educational institutions actively involved in the matter. From a public health perspective, this description corroborates many previous observations that, by means of anthropometric measurements, have stated the need for actions to reverse the rise of indexes of cardiovascular diseases risk in different contexts, in the present case, actions need to be thought to fit the needs of students from Technical Higher Education from Chile.

Collaborating students

Maipú Campus:

Gabriela Fuentes, Jennifer Oyaneder, José Seguel, Alejandro Cifuentes.

San Bernardo Campus:

Allyson Erazo, Bastián Vásquez, Marco Salome.

Puente Alto Campus:

Michael Cerda, Michel Dallez, Maximiliano Navarrete

Viña del Mar Campus:

Nicole Echaniz, Jennis Huerta, Miguel Aguilera, Christian Villalobos, Sebastián Pérez.

References

- 58 Alvero, J., Cabañas, M., Herrero, A., Martinez, L., Moreno, C., Porta, J., ... José, S. (2009). Protocolo de valoración de la composición corporal para el reconocimiento médico-deportivo. documento de consenso del grupo Español de Cineantropometría de la federación española de medicina del deporte. *Archivos de Medicina Del Deporte*, 26, 166–179.
- Bustos, P., Amigo, H., Arteaga, A., Acosta, A. M., & Rona, R. (2003). Factores de riesgo de enfermedad cardiovascular en adultos jóvenes. *Revista Médica de Chile*, 973–980.
- Carmenate Moreno, M. M., Marrodán Serrano, M. D., Mesa Saturnino, M. S., Montero De Espinosa, M. G., & Alba Díaz, J. A. (2007). Obesidad y circunferencia de la cintura en adolescentes madrileños. *Revista Cubana de Salud Publica*, 33(3), 1–9. <http://doi.org/10.1590/S0864-34662007000300015>
- Corvos, C. (2011). Porcentaje de grasa e índice cintura-cadera como riesgo de salud en universitarios. *Multiciencias*, 11, 303–309.
- Health, N. I. of. (1998). *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*. NIH Publication (Vol. 90–4083).
- INE Chile. (2015). *Estadísticas Vitales Anuario 2013*. (C. N. de E. Vitales, Ed.). Santiago, Chile: MINSAL, SRCel, INE. Retrieved from www.inw.cl
- Koch, E., Romero, T., Manríquez, L., Taylor, A., Román, C., Paredes, M., ... Kirschbaum, A. (2008). Razón cintura-estatura : Un mejor predictor antropométrico de riesgo cardiovascular y mortalidad en adultos chilenos . Nomograma diagnóstico utilizado en el Proyecto San Francisco. *Revista Chilena de Cardiología*, 27, 23–35.
- Michelotto, M., Martins, R., Machado, E., Santos, E., & Carvalho, T. (2010). Relación de Indicadores Antropométricos con Factores de Riesgo para Enfermedad Cardiovascular. *Sociedad Brasileña de Cardiología*, 94(4), 462–469.

MINEDUC. (2015, October 20). Uno de cada cinco alumnos de 8 ° básico tiene riesgo cardiovascular. *Diario La Tercera*, p. 15. Santiago.

Ojeda, R., & Cresp, M. (2011). Correlación entre Índice de Masa Corporal y Circunferencia de Cintura en una Muestra de Niños, Adolescentes y Adultos con Discapacidad de Temuco, Chile. *International Journal of Morphology*, 29, 1326–1330. <http://doi.org/10.4067/S0717->

95022011000400043

Velázquez-Monroy, Ó., Rosas Peralta, M., Lara Esqueda, A., Pastelín Hernández, G., Castillo, C., Attie, F., & Tapia Conyer, R. (2003). Prevalencia e interrelación de enfermedades crónicas no transmisibles y factores de riesgo cardiovascular en México: Resultados finales de la Encuesta Nacional de Salud (ENSA) 2000. *Archivos de Cardiología de México*, 73(1), 62–77.

Anexos

Category	BMI	Obesity class
Underweight	< 18.5	
Healthy	18.5 - 24.9	
Overweight	25 - 29.9	
Obese	30 - 34.9	I
	35 - 39.9	II
Extremely Obese	≥ 40	III

Table I Categories according to BMI. (Health, 1998)

Program	Gender	San Bernardo	Puente Alto	Maipú	Viña del Mar	Total
PTT	Men	75	97	159	125	456
	Women	20	25	40	42	127
	Total	95	122	199	167	583
PT	Men	0	25	10	29	64
	Women	0	50	17	46	113
	Total	0	75	27	75	177
Total	Men	75	122	169	154	520
	Women	20	75	57	88	240
	Total	95	197	226	242	760

Table III Subjects measured by Program, Gender and Campus (n)

Descriptive study on cardiovascular risk and obesity level on DUOC UC† Students

CVR Level	Men	Women	Total
Low	368	164	532
Moderate	111	44	155
Hight	41	32	73
Total	520	240	760

Table III, CVR (Cardiovascular Risk) level, absolute distribution by gender

CVR level	Viña del Mar	Puente Alto	San Bernardo	Maipú
Low	174	118	70	170
Moderate	54	41	17	43
High	14	38	8	13
Total	242	197	95	226

Table IV, CVR (Cardiovascular Risk) level absolute distribution by Campus

CVR Level	PTT	PT
Low	428	104
Moderate	115	40
Hight	40	33
Total	583	177

Table V, CVR (Cardiovascular Risk) absolute distribution level by program, PTT (Physical Training Technician); PT (Physiotherapy Technician).

Program	Gender	San Bernardo	Puente Alto	Maipú	Viña del Mar	Total
PTT	Men	24.18 ± 3.00	24.54 ± 3.51	24.83 ± 3.03	24.31 ± 2.92	24.52 ± 3.11
	Women	23.96 ± 2.80	23.96 ± 3.42	22.74 ± 2.46	23.47 ± 2.65	23.41 ± 2.79
	Total	24.14 ± 2.95	24.42 ± 3.49	24.41 ± 3.04	24.10 ± 2.87	24.28 ± 3.07
PT	Men	-	24.47 ± 4.50	25.27 ± 3.01	24.31 ± 3.84	24.52 ± 3.96
	Women	-	25.68 ± 4.65	25.99 ± 4.51	24.94 ± 5.35	25.43 ± 4.90
	Total	-	25.28 ± 4.61	25.72 ± 3.97	24.70 ± 4.80	25.10 ± 4.59
Total	Men	24.18 ± 3.00	24.53 ± 3.72	24.86 ± 3.02	24.31 ± 3.10	24.52 ± 3.22
	Women	23.96 ± 2.80	25.11 ± 4.33	23.71 ± 3.50	24.24 ± 4.32	24.36 ± 4.05
	Total	24.14 ± 2.95	24.75 ± 3.96	24.57 ± 3.18	24.28 ± 3.58	24.47 ± 3.50

Table VI Mean BMI (Body Mass Index) by gender, program and Campus (n=760, Table II)

MSC. MARCELO VENEGAS A. / MSC. HERNÁN SALINAS M. / LIC. MARIO NÚÑEZ L. / PROF. MURICIO TAPIA Z.
MSC. C. MANUEL GALLARDO V. / MSC. CRISTIAN MOLINA P. / MSC. MARTA MIRO M.

Program	Gender	San Bernardo	Puente Alto	Maipú	Viña del Mar	Total
PTT	Men	Healthy	Healthy	Healthy	Healthy	Healthy
	Women	Healthy	Healthy	Healthy	Healthy	Healthy
	Total	Healthy	Healthy	Healthy	Healthy	Healthy
PT	Men	-	Healthy	Overweight	Healthy	Healthy
	Women	-	Overweight	Overweight	Healthy	Overweight
	Total	-	Overweight	Overweight	Healthy	Overweight
Total	Men	Healthy	Healthy	Healthy	Healthy	Healthy
	Women	Healthy	Overweight	Healthy	Healthy	Healthy
	Total	Healthy	Healthy	Healthy	Healthy	Healthy

Table VII Obesity Level (according to BMI) by gender, Program and Campus according BMI by group

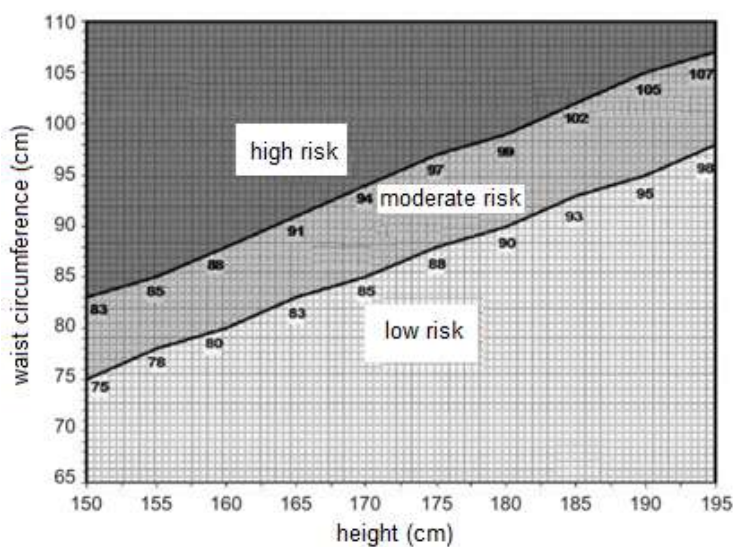


Figure I Waist Circumference / Height Nomogram, identifying 3 risk zones calculated based on values of WHtR (Waist circumference–height ratio). (Koch et al., 2008)

Descriptive study on cardiovascular risk and obesity level on DUOC UC† Students

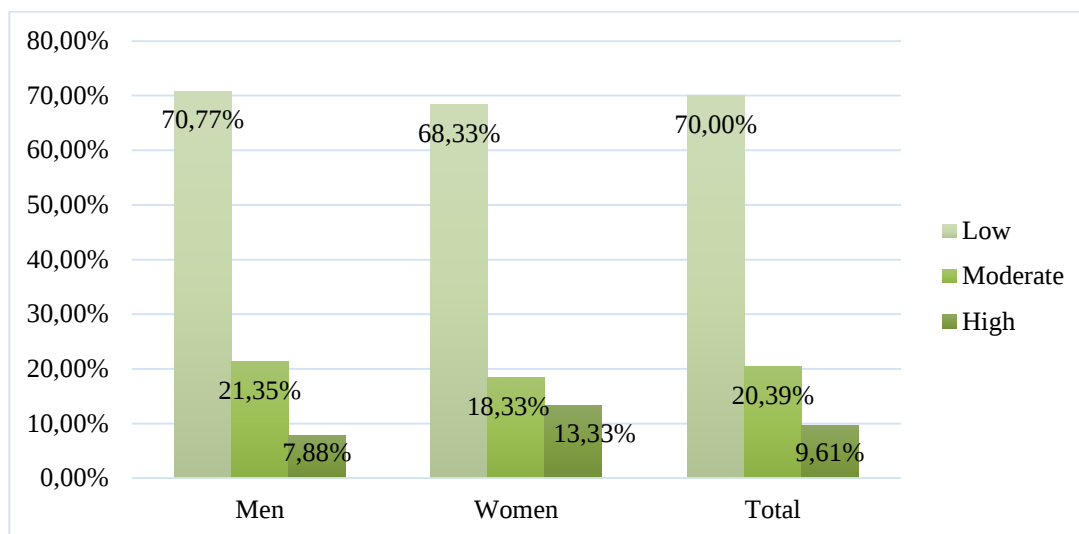


Figure II, CVR (Cardiovascular Risk) level relative distribution by Gender (n Men=520; n Women=240; n Total=760)

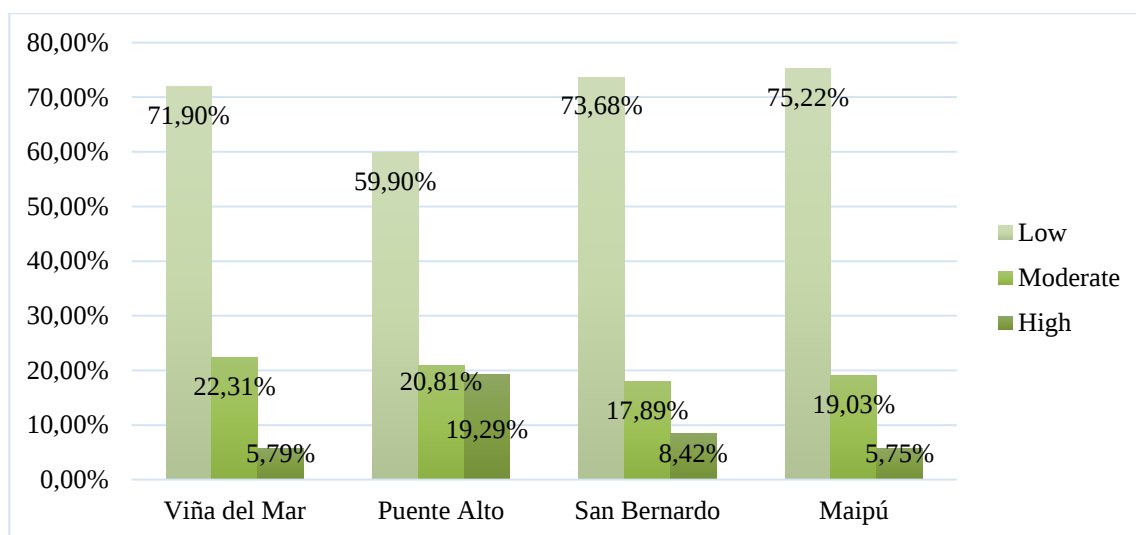


Figure III, CVR (Cardiovascular Risk) level relative distribution by Campus (n Viña del Mar = 242; n Puente Alto = 197; n San Bernardo=95; n Maipú = 226)

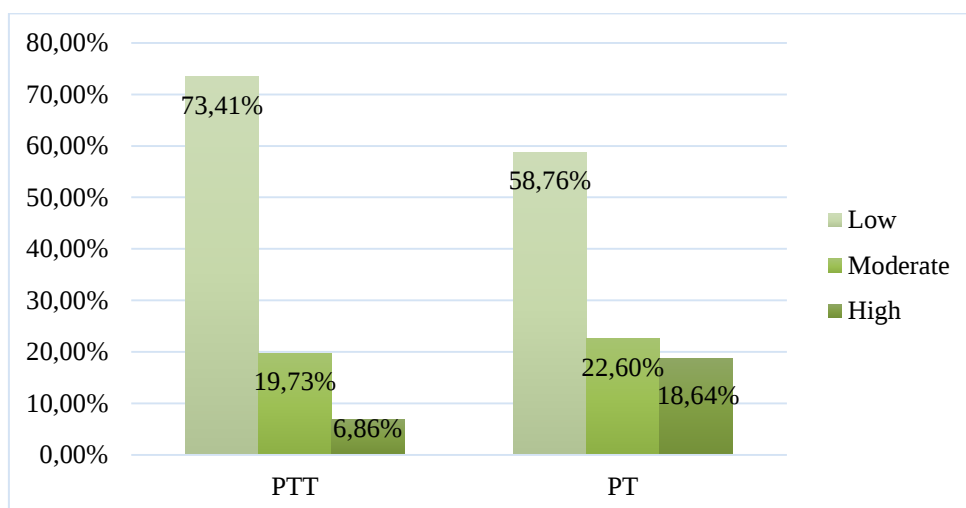


Figure IV CVR (Cardiovascular Risk) level relative distribution by program (n PTT = 583; n PT = 177). PTT (Physical Training Technician); PT (Physiotherapy Technician).

Para Citar este Artículo:

Venegas A., Marcelo; Salinas M., Hernán; Núñez L., Mario; Tapia Z., Mauricio; Gallardo V., Manuel; Molina P., Cristian y Miro M., Marta. Descriptive study on cardiovascular risk and obesity level on DUOC UC† Students. Rev. Arch. Soc. Chil. Med. Deporte. Vol. 63. Num. 2, Julio-Diciembre (2018), ISSN 0719-7322, pp. 54-63.

Las opiniones, análisis y conclusiones del autor son de su responsabilidad no necesariamente reflejan el pensamiento de la **Revista Archivos de la Sociedad Chilena de Medicina del Deporte**.

La reproducción parcial y/o total de este artículo debe hacerse con permiso de la **Revista Archivos de la Sociedad Chilena de Medicina del Deporte**