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Betty Valdivia

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"CARDIOMETABOLIC RISK FACTORS, SEVERITY OF OBESITY AND MINIMAL RESIDUAL DISEASE IN ACUTE LYMPHOBLASTIC LEUKEMIA IN CHILDREN."

Betty Valdivia Fernández [1,2]

[1,2]Department of Pediatrics Regional Hospital Honorio Delgado Espinoza. Arequipa (2) Faculty of Medicine of the University Catolica Santa Maria. Arequipa, Perú

Correspondence:
Betty Valdivia Fernnandez
bettyvalfer@gmail.com
ZIP. 04012
Cel.943247930
Avda. Spain No. 111 ASA. Arequipa, Perú

ABSTRACT

Cardiometabolic risk factors, severity of obesity in minimal residual disease (MRD) after induction chemotherapy in acute lymphoblastic leukemia (ALL) in children were evaluated. The participants were 11 hospitalized at HRHDE and IREN SUR from October, 2016 to September, 2017, with the diagnosis of acute lymphatic leukemia (ALL), by flow cytometry. A prospective quasi-experimental study was Conducted Where the risk of EMR was evaluated having

.63.63% had EMR, of them 45.45% older than 10 years were, 54.54% Were male, 27.27% came from Puno. With subtypes of ALL: B-common 18.18%, B-common / pro-B 18.18%; overweight 9.09%, obesity 9.09% and Normal 36.36%, obesity pre-chemotherapy has 1.5 times more risk of having EMR. Post-QMT cardiometabolic risk factors have low risk.

Keywords: obesity, cardiometabolic, MRD, ALL,

INTRODUCTION

Obesity has become the epidemic of the XXI century for the world. Excess weight affects 20 million children under 5 years. In the world 110 million children and adolescents were obese in 2013 [48].

The national prevalence of overweight and obesity in children and adolescents 2012 - 2013 in children under 5 years: 6.4%, children 5 to 9 years: 29.4%; adolescents 10 to 19 years. 24.2% Peru ranks eighth in the world ranking of childhood obesity according to (PAHO, August 2012) [2] According to the Cancer Registry of the Hospital Regional Hospital Honorio Delgado Espinoza of Arequipa between 2010 and 2014, it found that childhood cancer is 5.6% of all cancers. [8]

Recent estimates indicate that obesity related to cancer represents 9% of women in North America, Europe and the Middle East. In April 2016, the International Agency for Research on Cancer (IARC) based in Lyon, France, convened a working group to revalue the preventive effects of weight control in cancer risk. [48] Experimental studies in rodents, obesity promotes tumorigenesis and cancer incidence increases with age in various cancers, including leukemia [5]

Obesity is associated with endocrine, metabolic, alterations in the metabolism of sex hormones, insulin, IGF, adipokines and inflammatory pathways anorrmalidades. There is strong evidence of the role of metabolism of sex hormones and chronic inflammation that mediate the relationship between cancer and obesity. So there belief that the low weight positively affects these mechanisms. The beneficial effect on the risk of cancer appears to be mediated in part by regulation between cell proliferation and apoptosis [48].

Obesity is associated with poor disease-free survival in acute lymphoblastic leukemia. In a study to evaluate the minimal residual disease (MRD) following induction cytometry multidimensional flow in overweight or obese, with ALL B-precursor found that obesity was associated with high significant risk of persistent EMR and poor free survival estimated disease [3]

Acute lymphoblastic leukemia (ALL) child is the most common childhood cancer. Leukemic relapses have been linked directly to the survival of blasts in organs such as the central nervous system (CNS) or testicles .. Adipose cells from bone marrow, act as a niche that protects cells against leukemia drug-induced death. [5]

The study of Italian Association of Pediatric Oncology Hematology and acute lymphoblastic leukemia Frankfurt conducted an investigation to determine prognostic factors in acute lymphoblastic leukemia by molecular PCR study and found that 6% had high risk if the day 33 of the induction were more minimal residual disease (MRD) of 10/03, this is a highly sensitive predictor of relapse LLA b childhood and disease-free survival to 5 years estimated (SLE), with a 50.1% in this group . [6]

In this study the influence of overweight, obesity and cardiometabolic risk factors in minimal residual disease after induction chemotherapy in children hospitalized with acute lymphatic leukemia was evaluated.

MATERIAL AND METHODS:

Patient population: Participants were new children 2 to 14 years, hospitalized in HRHDE and IREN SUR from October 2016 to September 2017, with the diagnosis of acute lymphocytic leukemia by bone marrow by flow cytometry,

In the data collected; cardiometabolic risk factors, the severity of obesity pre-chemotherapy induction and post induction chemotherapy, and the presence of minimal residual disease after treatment were evaluated quimioterapia. El was received with chemotherapy regimen induction Oncology group in LLA.de novo children.

I was interviewed individually to each of the children and parents, the data sheet is applied to meet the sociodemographic characteristics of the participants, cardiometabolic risk factors, severity of obesity, the immunophenotype of the lymphoblasts of acute lymphocytic leukemia cytometric flow pre induction chemotherapy and persistence of minimal residual disease after induction chemotherapy in HRHD and IREN Arequipa.

They are weight scales and were standing across stadiometer older than 2 years, and evaluated with tape measure waist circumference. calculate BMI using the formula weight / height 2 were made, and evaluated with WHO tables Z score of BMI for age, BMI percentile for age to determine overweight, obese, normal and emaciated, tables WHO and CDC to assess the severity of obesity. Considered overweight if Z-score is between +2 and +3 P85 to P95 or, if Z-score obesity is> +3 or> P95, normal if Z-score is between -2 and +2 or P5 to P85 and emaciated or low weight if Z-score is <-2, and -3 or <P5 according to the American Academy of Pediatrics (AAP, CDC IOTF). [38,39,40,41]
calculations Waist circumference age percentiles were held and obesity evaluate on the table waist children age 2 to 18 and by sex. [(37] the ratio of waist circumference / height is then calculated. considering PC / E as a risk factor if greater than 90 percentile, if the ICT is increased visceral obesity de0,5 indicates [35]
measuring the blood pressure in the supine position with pediatric tensiometer be taken and evaluated percentile for age and height according tables [34], considering elevated above the P95 hipertensión.de according AAP 2017
Were taken pre- chemotherapy, fasting blood samples at 7am for processing cholesterol, HDL cholesterol, LDL cholesterol, triglycerides and glycosylated hemoglobin and processed in laboratories and IREN HRHDE and high results are considered according to parameters cardiometabolic risk factors. HDL is considered as risk <of 40mgr / dl, cholesterol> 200mgr / dl, triglycerides> 130mgr / dl yLDL> 130mgr / dl., Glycated Hb> 6,66mgr / d, according to the NCEP
T pre-bone marrow was diagnosed perform pre- induction chemotherapy for hematology or pediatric oncology, and evaluated by flow cytometry to determine the immunophenotype of leukemia, such as pre-B, B-common, pro-B, mixed, / cortical, T-intermediate between cortical and medullary. These samples are sent to INSN for evaluation.
In the case of confirmed acute lymphatic leukemia and stabilized patient induction chemotherapy according to the protocol for acute lymphatic leukemia of each hospital is applied. 29 days, vincristine EV1,4mgr / m2, daunorubicin EV 30mgr / m2 / week for 4 cycles, Asparaginase IM 6000U / m2 / 6 doses applied prednisone 40 to 60mgr / mt2VO. /. Completed four cycles of chemotherapy bone marrow aspirate be fulfilled, hematology or pediatric oncology. and I was evaluated by flow cytometry for the presence of minimal residual disease in INSN. It considered free if EMR <0.01% and if EMR> 0.01% [47]
Post-induction chemotherapy, new controls weight, height and blood pressure were taken and BMI calculations are performed and evaluated by Z-score, percentiles. It also takes waist circumference is evaluated by percentiles. the waist size ratio is calculated according to the parameters considered pre .. Post chemotherapy induction chemotherapy were taken, fasting blood samples at 7am for processing cholesterol, HDL cholesterol, LDL cholesterol, triglycerides and glycosylated hemoglobin and processed HRHDE in laboratories and IREN.

Inclusion criteria
The population of children aged 1month to 14 years 11 months who underwent nutritional assessment and was assessed factors of cardio-metabolic risk
Diagnosed with acute lymphatic leukemia bone marrow aspirate pre induction chemotherapy and bone marrow after induction chemotherapy and have completed the chemotherapy protocol scheduled induction.
Signed informed consent agreeing to be part of the study voluntarily by parents or guardians and assent of children under 7 years.
Exclusion criteria.
That are not in the set age group.
Who they have received radiotherapy intracranial
Not wishing to participate in the study.
They are not able to carry out studies of bone marrow for not giving informed consent.
Patients who died in the period of induction.
Patients who discontinue treatment of induction chemotherapy
In the statistical analysis; data are classified in systematization matrix created in Excel for this purpose. For systematization use open questions in order of frequency of responses, they tabulate later. They are coded according to database and dictionary of variables SPSS version 25.0.Se tables prepared according to the variables analyzed.
We used the chi-square test of homogeneity to evaluate differences between assessments at baseline, pre-chemotherapy study as severity of obesity, cardiometabolic risk factors, bone marrow by flow cytometry and after induction chemotherapy .The participating children followed the quasi-experimental statistical design related samples to compare the before and after induction chemotherapy for each of the variables. a significance level of 5% was applied. p <0.05 as statistically significant is considered.
Also to determine risk factors: obesity and cardiometabolic risk factors post- chemotherapy, affecting minimal residual disease relative risk (RR) was applied.

RESULTS

Of 11 patients diagnosed with ALL, they found minimal residual disease (EMR) post-QMT induction, 7 (63.63%), the majority were male 6 (54.54%), (p = 0.79), with significant relationship between the age of> 10 years and the EMR 5 (45.45%) (p = 0.02), came predominantly from Arequipa 2 (18.18%) and Puno 3 (27.27%) (p = 0 , 08), of the hospitals: HRHDE 4 (36.36%) and IREN-Sur 3

(27.27%.) (P = 0.81). (Table 1). Post-QMT cardiometabolic high risk factors according to the subtype of ALL at diagnosis were: waist circumference> P90 1 (9.09%) in ALL-B ALL, waist / height index (ICT) 3 (27.27%) in ALL-B ALL, Pressure arterial> P95 1 (9.09%) in ALL-B ALL, none had glycosylated Hb> 6.66%, fasting blood glucose> 100mgr / dl 1 (9.09%) in B-common ALL., HDL <40mgr / dl 4 (40.00%) in ALL-B and 2 (20.00%) in ALL-B / pre-B, none presented cholesterol> 200mgr%, Trigliceri two> 130mgr / dl 2 (22.22 %) in B-common ALL, none presented LDL> 130mgr / dl. (Table 2) .The severity of post-QMT obesity and subtype of leukemia at diagnosis were: Overweight 1 (9.09%) in B-common and B-common / pre-B respectively, none presented post-QMT obesity , emaciated 1 (9.09%) in B-common and in B-common / pre-B respectively (table 3). The most frequent ALL immunophenotypes in the persistence of EMR were B-common 2 (18.18%) and Common / pro-B 2 (18.18%) p = 0.80. (Table 4) .In the severity of pre-QMT obesity and the persistence of EMR were mostly normal weight 4 (36.36%), overweight and obese 1 (9.09%) p = 0.67 and 0.77 respectively. (Table 5). The factors of high pre-QMT cardiometabolic risk and persistence of post-QMT EMR were: ICT> 0.05 2 (18.18%) p = 0.13, glycosylated Hb> 6 , 66%: 4 (44.44%) p = 0.09, glycemia> 100mgr / dl 4 (36.36%) p = 0.81, triglycerides> 130mgr / dl: 2 (22.22%) p = 0.25. (table 6). No risk was found between overweight, post-QMT emaciation and persistence of EMR, RR = 0.7 respectively. (Tables 7 and 8) Pre-QMT obesity has 1.5 times the risk of having persistence of post-QMT EMR regarding those free of EMR, RR = 1.50 with 95% CI (0.85-2.64) (table 9). The post-QMT cardiometabolic risk is not significant in the persistence of EMR, as in: HDL <40mgr / dl: 3 (33.33%) RR 0.80 (table10), ICT> 0.5: 2 (18.18%) RR 0.48 (table 11). Glycemia> 100mgr%: 1 (9.09%) RR 0.75 (table 12) and BP> P95: 1 (9.09%) RR .0.75 (table 13).

DISCUSSION

The International Agency for Research on Cancer, based in Lyon (IARC) recommend preventive effects of weight control in cancer, estimating the risk by BMI, finding significant association between some solid tumors and obesity in adults [48], but there are few studies in children that demonstrate the association of obesity and acute lymphocytic leukemia, which is the most frequent neoplasia at this age. Nutritional assessment in children in this study was carried out by the weight and height, BMI, being valued by Z-.score with tables WHO {38,39] and percentiles to the tables of the CDC {40,41] which allowed us to make a personalized nutritional assessment. Here we evaluate the risk between obesity and cardiometabolic risk factors and minimal residual disease in children with acute lymphocytic leukemia pre- and post-induction chemotherapy. Finding that children diagnosed with acute lymphatic leukemia (ALL) who were obese pre-chemotherapy (QMT) Induction had 1.5 times greater risk of persistence of minimal residual disease (MRD) in bone marrow. Adipocytes represent the largest component of the bone marrow. The leukemia cells migrate and are integrated within the adipose tissue, which is mediated by a factor derived stromal cells (SDF-1alpha) and increases its immediate exposure to adipokines. [3] The presence of labeled adipocytes reduce the effectiveness of chemotherapeutic agents used in induction therapy (vincristine, daunorubicin) in in vitro and in vivo models of mouse cultures. [5] .Etan and Orgel et al. in LA they found that obesity and overweight are associated with a high risk to the EMR with OR, 2.57. [3] .Nuñez Enriquez et al in Mexico, found a risk of relapse in bone marrow in obese HR 1.4 CI 95% (0.9-2.3), (42). The pre QMT RR induction have EMR, found in this study was similar to Mexico, with a RR 1.5 95% CI (0.85 to 2.64). [42]

The adverse impact dela obesity in early response to disease has significant implications with poor disease-free survival {3] and early mortality HR 95% CI 1.5 (0,8-2-7) (34), so obese diagnosis of aLL should be considered a risk group ([34] .The EMR frequency by flow cytometry> 0.01% post-induction QMT in this study was 7 (63.63%.) which is considered high compared to other studies, Jan Stary et al reports an incidence of relapse 5-year cumulative 19% in an intercontinental multicenter study. [43]. in Mexico early relapse frequency was 14.7% [42].

The persistence of high cardiometetabolico risk factors according to immunophenotype LLA were more frequent as B-common / pro-B, B-common and pre-T cortical. LDL> 130 mgr / dl post QMT, was not elevated in any immunophenotype of ALL. HDL <40 md / dl post-QMT, was more frequent in B-common, and triglycerides> 130mgrs / dl post-QMT alone was high in B-common. J and Malhotra et al. USA found that the triad of atherogenic dyslipidemia with high LDL, low HDL and TGC high post-QMT is associated with visceral obesity and increased morbidity and mortality in adulthood [44] .The Hyperglycemia> 100mgr / dl post-QMT, It was elevated in only B-common. 1 (9.09%) which is lower than that found by Bi-Hong Zhang in China with post-QMT Hyperglycemia in children with ALL, 23,90% which he was associated with a poor prognosis with survival rate and lower than the euglycemic-free rate of relapse. Post-QMT. [45]. The waist / height (ICT)> 0,5post-QMT index was raised more frequently in B-Common, Common B-pro-B and / pre-B-common B. and waist circumference> P90 post-QMT is found in a case of / pro-B-common B. Wolfgram P. and et al. US refer to the lifting waist circumference and ICT is a predictor of insulin resistance comparable to the measurement of abdominal fat by MRI in non-obese women ([30]. Post-QMT P90 was found in a case / pro-B-common B. Wolfgram P. and et al. US refer to the lifting waist circumference and ICT is a predictor of insulin resistance comparable to the measurement of abdominal fat by MRI in non-obese women ([30]. Post-QMT P90 was found in a case / pro-B-common B. Wolfgram P. and et al. US refer to the lifting waist circumference and ICT is a predictor of insulin resistance comparable to the measurement of abdominal fat by MRI in non-obese women ([30].

Severity of obesity and overweight evaluated emanciado or underweight post-QMT found in B-common and B-common / pre-B 18.18% respectively. No cases found persitencia post QMT obesity, since this was obese at diagnosis step to normal. Orgel ethan revealed that the ends as obesity and low weight and weights remaining post-QMT had higher risk, disease-free survival less than normal weight [25].

Regarding the inmunofetipos LLA by flow cytometry having EMR the most frequent was Bcomun and Bcomun / pro-B (18.18%) respectively, were free of EMR post induction QMT detection 36.36% EMR by flow cytometry and PCR -RQ is similar. (46) .The found that those EMR <0.01% at day 19, had a day 46 98.0 survival rate, disease free survival (EFS) 95.3 4 and relapses and were considered low risk. [47].

Cardiometabolic risk factors pre-QMT had no significant relationship with persistent EMR ($p < 0.05$). ICT, glycated Hb, fasting glucose, low HDL and high triglycerides were elevated. Ashley C. and et a. North Carolina found cancer in people without these risk factors altered except high blood pressure in type III obesity. [49] Cardiometabolic risk factors that persisted high post-QMT ICT were high, hyperglycemia, low HDL and high blood pressure, the risk of these factors in the persistence of the EMR was added under. However should be further evaluated hyperglycemia relative to disease-free survival (37) and the high ICT, low HDL, and elevated BP cardiovascular disease post-QMT [44].

The strength of this study was a prospective study is one of the first to investigate the association of cardiometabolic risk factors and obesity with persistent minimal residual disease pre- and post-induction chemotherapy in children.

Limitations of the study is that it was a small town, held only two hospitals. However, the study was continued for three years to have a larger population and do multicentric.

Should continue investigations in patients with ALL and pre- chemotherapy obesity as a major risk factor in post-EMR QMT induction and its association with poor disease-free survival and follow-up of patients with cardiometabolic risk factors high and its association with cardiovascular disease mortality risk post chemotherapy

CONCLUSIONS

The pre-QMT obesity in children with acute lymphatic leukemia have a high risk of having 1.5 times EMR <0.01% post-induction QMT. Cardiometabolic risk factors high in children with acute lymphatic leukemia have low risk <1 EMR having residual post-QMT. Cardiometabolic risk factors that persisted altered post-QMT ICT were high, hyperglycemia, low HDL and high blood pressure.

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Ethics and Informed Consent

The work was approved by the Ethics Committee of the Santa Maria Catholic University of Arequipa, Peru and informed consent was requested parents of patients and consent of children older than 7 years for participation in research work.

Conflicts of interest

It declares no conflicts of interest.

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Table 1. demographic characteristics and Persistenciade EMR

Demographic characteristics	all patients		Persistence of EMR					
			Yes		Do not			
	No.	%	No.	%	No.	%	Ji2 P	RR
RR Total	eleven	100.00	7	63.63	4	36.36		

Age										
> 10a	5	45.45	5	45.45	0	0	5.23	0.02	3.00	
2-10	6	54.54	2	18.18	4	36.36				
gender							0,06	0,79		0,79
male	10	90.90	6	54.54	4	36.36				
female	one	9.09	one	9.09						
origin							2.88	0.08		2.50
Fist	3	27.27	3	27.27						
Arequipa	5	45.45	2	18.18	3	27.27				
Cusco	2	18.18	2	18.18	one	9.09				
Tacna	one	9.09								
Hospital							0.05	0.81		1.11
HRHDE	6	54.54	4	36.36	2	18.18				
IREN SUR	5	45.45	3	27.27	2	18.18				

Table 2.Factores risk Cardiometablico post QMT and Sub-type of leukemia

Risk factors cadiometabolico	Sub-type of leukemia diagnosis										Total patients		Chi 2 Next.
	preT / cortical		B-common		B-common / Pro-B		Bcomun / preB		intermediate T				
	N	%	N	%	N	%	N	%	N	%	No.	%	
Total	one	8,33	5	54.54	2	16.66	2	18.18	one	9.09	eleven	100.00	0.296
Perímetrode Waist:													0.006
<P90	one	9.09	5	54.54	one	9.09	2	18.18	one	9.09	10	90.90	
> P90					one	9.09					one	9.09	
ICT: <0.5	one	9.09	2	18.18	one	9.09	one	9.09	one	9.09	6	54.54	0.763
ICT:> 0.5			3	27.27	one	9.09	one	9.09			5	45.45	
Blood pressure:													
<P95			4	36.36	2	18.18	2	18.18	one	9.09	9	81.81	0.034
> P95 (tipoi)	one	9.09	one	9.09							2	18.18	
Hb glycated:													
<6.66%			one	25,00	one	25,00	one	25,00	one	25,00	4	100.00	
> 6.66%													
Fasting glucose:													
<100mgrs%			4	36.36	2	18.18	2	18.18	one	9.09	9	81.81	0.034
> 100mgrs%	one	9.09	one	9.09							2	18.18	
Lipidic profile:													
HDL													
<40mg / dl			4	40.00			2	20,00	one	10.00	8	80,00	0.738
> 40mg / dl			one	10.00	one	10.00					2	20,00	
CHOLESTEROL													
<200mg / dl			4	44.44	one	11.11	2	22.22	one	11.11	9	100.00	
> 200mg / dl													
TRIGLYCERIDES													
<130mg / dl	one	11.11	2	22.22	one	11.11	2	22.22	one	11.11	7	77.77	0.095
> 130mg / dl			2	22.22							2	22.22	
LDL													
<130mg / dl	one	11.11	4	44.44	one	11.11	2	22.22	one	11.11	9	100.00	
> 130mg / dl													

Table 3 Severity of post obesity and type of leukemia QMT

Severity of obesity post-QMT	Sub-type of leukemia												
	pre-T		B-common		B-common / Pro-B		Bcomun / preB		intermediate T		Total patients		
	No.	%	No.	%	N	%	N	%	N	%	No.	%	Chi 2 Next
Total	one	9.09	5	45.45	200%	22.00%			one	9.09	eleven	100.00	0.296
Overweight obesity I			one	9.09			one	9.09			2	18.18	0.103
Normal	one	9.09	3	27.27	2	18.18			one	9.09	7	63.63	
emaciated			one	9.09			one	9.09			2	18.18	

Table 4. Sub-Type Leukemia and persistence of EMR

Immunophenotyping Leukemia	all patients		Persistence of EMR				
			Yes		Do not		
	No.	%	No.	%	No.	%	Ji2 P
Total	eleven	100.00	7	63.63	4	36.36	
B-common	5	45.45	2	18.18	3	27.27	0.05 0.80
B-common / Pro-B	2	18.18	2	18.18			
Bcomun / preB	2	18.18	one	9.09	one	9.09	
Pre-T / cortical	one	9.09	one	9.09			
T-intermediate	one	9.09	one	9.09			

Table 5 Severity of pre-QMT and persistence of obesity EMR

Severity of obesity pre-QMT	All patients		Persistence of EMR				Ji2 P
			Yes		Do not		
	No.	%	No.	%	No.	%	
Total	eleven	100.00	7	63.63	4	36.36	
Overweight	2	18.18	one	9.09	one	9.09	0.17 0.67
Obesity	one	9.09	one	9.09			0.08 0.77
Normal	6	54.54	4	36.36	2	18.18	
emaciated	2	18.18	one	9.09	one	9.09	0.17 0.67

Table 6. cardiometabolic risk factors pre-QMT and EMR

Cardiometabolic risk factors	Persistence of EMR				Total patients		
	Yes		Do not				
	No.	%	No.	%	No.	%	Ji2 P
Total	7	63.63	4	36.36	eleven	100.00	
Waist circumference							
<P90	7	63.63	4	36.36	eleven	100.00	
> P90							
ICT: <0.5	5	45.45	one	9.09	6	54.54	2,21 0,13
ICT:> 0.5	2	18.18	3	27.27	5	45.45	
Blood pressure:							
<P95	7	63.63	one	9.09	8	72.72	
> P95			3	27.27	3	27.27	
Hb glycated:							
<6.66%	one	11.11	3	33.33	4	44.44	2,72 0,09
> 6.66%	4	44.44	one	11.11	5	55.55	
Fasting glucose:							
<100mgrs%	3	27.27	2	18.18	5	45.45	0.05 0.81
> 100mgrs%	4	36.36	2	18.18	6	54.54	
Lipidic profile							
HDL							
<40mg / dl	5	50,00	3	30,00	8	80,00	0.10 0.74
> 40mg / dl	one	10.00	one	10.00	2	20,00	
CHOLESTEROL							
<200mg / dl	6	60,00	4	40.00	10	100.00	
> 200mg / dl							
TRIGLYCERIDES							
<100-130mg / dl	4	44.44	3	33.33	7	77.77	1.28 0.25
> 100-130mg / dl	2	22.22			2	22, 22	
LDL							
<130mg / dl	6	60.60	4	40.40	10	100.00	
> 130mg / dl			one				

Table 7: Risk Severity obesity and post-QMT EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Severity of obesity	No.	%	No.	%	No.	%	
overweight	one	11.11	one	11.11	2	22.22	0,70 0,16 0,32
Normal	5	55.55	2	22.22	7	77.77	
Total	6	66.66	3	33.33	9	100.00	

Table 8: Risk Severity obesity and post-QMT EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Severity of obesity	No.	%	No.	%	No.	%	
emaciated	one	11.11	one	11.11	2	22.22	0,70 0,16 3,02
Normal	5	55.55	2	22.22	7	77.77	
Total	6	66.66	3	33.33	9	100.00	

Table 9: Risk of severity of pre-QMT and obesity EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Severity of obesity PRE-QMT	No.	%	No.	%	No.	%	
Obesity	one	14.28	0	0	one	14.28	1,50 0,85 2,64
Normal	4	57.14	2	28.57	6	85.71	
Total	5	71.42	2	28.57	7	100.00	

Tabla10: cardiometabolic risk of obesity and post-QMT EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Cardiometabolic risk factors Post-QMT	No.	%	No.	%	No.	%	
HDL <40	3	33.33	2	22.22	5	55.55	0,80 0,32 1,99
HDL> 40	3	33.33	one	11.11	4	44.44	
Total	6	66.66	3	33.33	9	10,000	

Tabla11: cardiometabolic risk and post-QMT EMR

	EMR				Total patients		RR
	Yes		Do not				
Cardiometabolic risk factors Post-QMT	No.	%	No.	%	No.	%	
ICT> 0.5	2	18.18	3	27.27	5	45.45	0.48 0.15 1.48
ICT <0.5	5	45.45	one	9.09	6	54.54	
Total	7	63.63	4	36.36	eleven	100.00	

Tabla12: cardiometabolic risk and post-QMT EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Cardiometabolic risk factors Post-QMT	No.	%	No.	%	No.	%	
Glycemia> 100	one	9.09	one	9.09	2	18.18	0.75 0.17 3.23
Glycemia <100	6	54.54	3	54.54	9	81.81	
Total	7	63.63	4	36.36	eleven	100.00	

Table 13: Post-QMT cardiometabolic risk and EMR

	EMR				Total patients		RR 95%
	Yes		Do not				
Cardiometabolic risk factors Post-QMT	No.	%	No.	%	No.	%	
PA.> P95	one	9.09	one	9.09	2	18.18	0.75 0.17 3.23
PA. <P95	6	54.54	3	27.27	9	81.81	
Total	7	63.63	4	36.36	eleven	100.00	