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IMPACT OF APELIN-13 ON OSTEOPOROSIS IN THE PATIENTS SUFFERING FROM DIABETES MELLITUS

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Abstract:

Objective: *This research work aimed to examine the association between Apelin-13 level in serum and BMD (Bone Mineral Density) as well as some other factors, and to determine the impact of Apelin-13 on the osteoporosis among patients suffering from T-2DM (Type-2 Diabetes Mellitus).*

Methodology: *There were total 67 persons in this research work. This research work carried out in Endocrinology Department of our institute from March 2015 to September 2019. We recorded the clinical information, age of the patient, sex, weight, height, BMI and duration of the disease for the patients of this research work. The collection of the blood samples carried out for the examination of Apelin-13, PINP (Procollagen Type-I N Propeptide) & crosslinked carboxyterminal telopeptide of Type-1 collagen and we used a dual-energy absorptiometry scanner for X-ray for the testing of the bone mineral density.*

Results: *We divided the patients into 3 groups. There were total nineteen patients in the group of osteoporosis, twenty five patients in the group of osteopenia and thirty two patients in the group of normal. Apelin-13 level in the group of osteoporosis was much lower as compared to the groups of normal & osteopenia. The level in the group of osteopenia was much low as compared to the group of normal. The analysis of correlation displayed that there was a positive correlation between Apelin-13 and BMD & PINP but it was present with negative correlation with the ICTP & age.*

Conclusion: *The findings of this research work showed that there was a strong association between the Apelin-13 and PINP, BMD & ICTP. There is a vital role of Apelin-13 in the prevalence of the osteoporosis among patients suffering from T-2DM.*

Keywords: *T-2DM, BMD, prevalence, osteoporosis, correlation, osteoporosis. Apelin-13.*

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INTRODUCTION:

DM is very serious issue of health and it is increasing very rapidly in the whole world [1, 2]. This abnormality has close correlation to the fragile fractures caused from the osteoporosis and T-2DM is the most important factor of risk for the fractures associated with the osteoporosis [3]. Bone fragility mechanism in the DM is very complicate and it includes hyperglycemia, increased produced of glycation end, oxidative stress, hypoglycemia induced because of treatment and some antidiabetic treatment with direct impact on bone & metabolism of mineral as well as high fall propensity, all these features are the contributors for the high risk of fractures among T-2DM [4]. Correlation between osteoporosis related with DM & mortality in T-2DM is confirm [5]. But, few patients suffering from T-2DM present low BMD, few patients are present with high and normal BMD [6], this show that there are some risk factors affecting the BMD level among patients suffering from T-2DM.

Many research works declared that Apelin-13 has the ability to regulate the homeostasis of glucose, secretion of insulin & sensitivity [7]. The most researched type of apelin is Apelin-13 [8]. Du & his colleagues in their research work on 69 patients suffering from DM discovered that Apelin-13 level in serum was significantly high in the patients suffering from diabetic retinopathy, confirming a strong association of Apelin-13 level with the diabetic retinopathy (DN) [9]. DN is the most important cause of the renal diseases of end stage according to Chen [10]. Additionally, Apelin-13 also can assuage the endoplasmic reticulum stress associated with diabetes in pancreas [11]. These research works have demonstrated that there is very important role of Apelin-13 in the treatment complications related to diabetes. This research work aimed to examine the association between Apelin-13 level and bone mineral density as well as some other strictures and to find out the impact of Apelin-13 on osteoporosis among patients suffering from T-2DM.

METHODOLOGY:

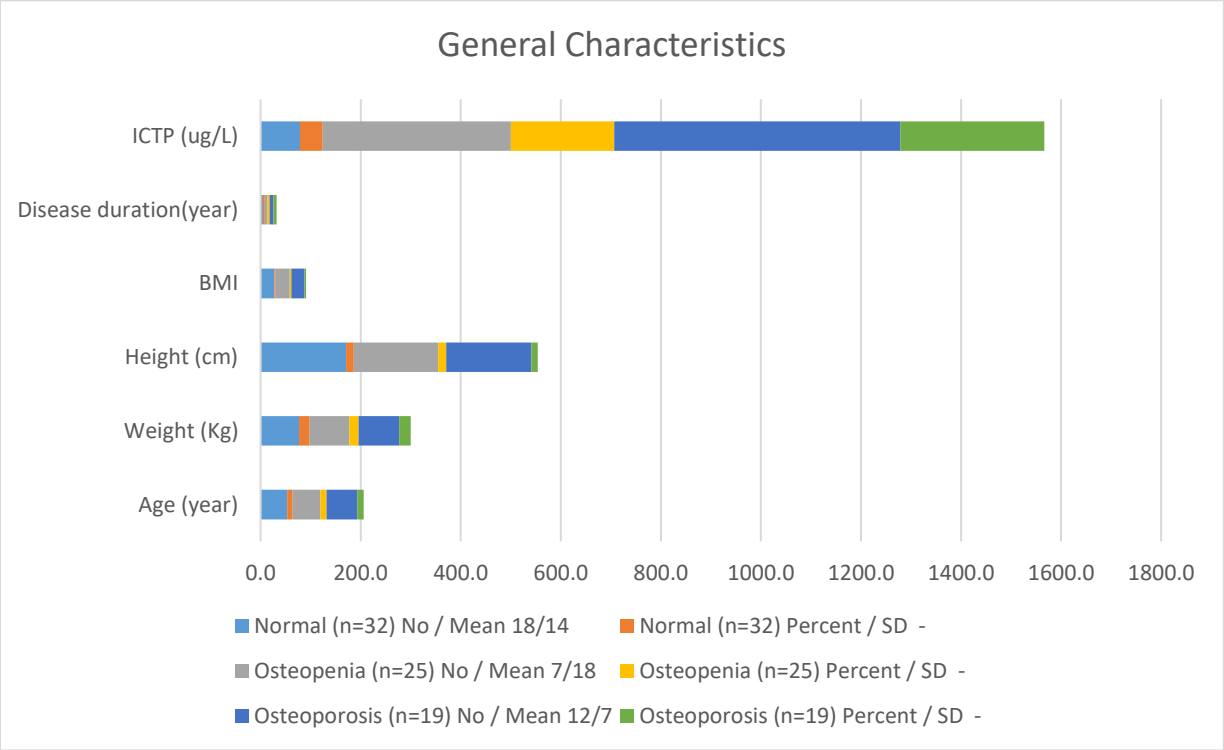
We recruited total 67 patients suffering from T-2DM from the Endocrinology Department from March 2015 to September 2019. We recorded the medical data as age, sex, weight, height, BMI and duration of disease for all the patients of this research work. The patients suffering from T-2DM and who gave their consent to participate in the research work were the participants of this research work. Patients suffering from some other complications were not the part of this research work. Ethical committee of the institute gave the permission to conduct this research work. We took the blood samples after fasting of overnight for the calculation of the Apelin-13, PINP and ICTP. We used a special kit for the measurement of the Apelin-13 level in serum. We used the dual energy X-ray absorptiometry scanner for the measurement of the BMD by 2 specialized technicians. To assess the BMD level, we used the T-scores and classification carried out according to criteria of WHO: T scores ≤ -2.50 SD shows osteoporosis; T score > -2.50 & <-1 SD shows osteopenia; T score ≥-1 shows normal [3]. We divided the patients according to these measurements. SPSS V.21 was in use for the statistical analysis of the collected information. We used the Chi square method to for comparison. We performed the correlation analysis with the help of Pearson's analysis.

RESULTS:

In this current research work, total seventy six patients suffering from T-2DM were the participants. We divided the patients into 3 groups, in which nineteen patients were in the group of osteoporosis, twenty five patients were in the group of osteopenia and thirty two participants were in the group of normal depending upon the outcome of the T-scores. The frequency of the osteoporosis, osteopenia & normal was 25.0%, 32.90% and 42.10% correspondingly in all three groups. The baseline information of the patients is present Table-1. We found significant disparities age, sex, Apelin-13 level and ICTP in the participants of all 3 groups. PINP level was much high in normal & osteopenia groups as compared to the group of osteoporosis. The level was very high in the group of normal as compared to the group of osteopenia, but we fund no significant disparity.

Table-I: General characteristics of patients in the three groups.

Characteristics	Normal (n=32)		Osteopenia (n=25)		Osteoporosis (n=19)		P-value
	No / Mean	Percent / SD	No / Mean	Percent / SD	No / Mean	Percent / SD	
Gender(F/M)	18/14	-	7/18	-	12/7	-	0.0370
Age (year)	53.0	11.0	56.0	12.0	61.0	13.0	0.0200
Weight (Kg)	77.0	21.0	79.0	19.0	81.0	23.0	0.0800
Height (cm)	171.0	15.0	169.0	16.0	170.0	13.0	0.8200
BMI	27.3	3.0	28.1	2.9	26.5	3.1	0.5100
Disease duration(year)	4.4	3.8	5.4	4.7	7.6	6.2	0.7900
Apelin-13 (Pg/ml)	1651.0	213.0	1258.0	198.0	967.0	172.0	0.0100
PINP (ug/L)	32019.0	11369.0	30075.0	10067.0	14551.0	7891.0	0.0300
ICTP (ug/L)	78.90	45.40	376.19	206.70	571.60	287.90	0.0020



ICPT level was significantly less in the groups of normal & osteopenia as compared to the group of osteoporosis and the level in the group of normal was much as compared to the group of osteopenia. Apelin-13 level in the group of osteoporosis was low as compared to all other groups and this level in the group of osteopenia was less than the value in the normal group. We discovered no significant disparity in the body mass index, weight, height and duration of the disease in all three groups (Table-1). The analysis for correlation showed that in the participants, the Apelin-13 level was present with correlation to the levels of BMD & PINP, whereas it has negative correlation with the age of the patients & ICTP.

DISCUSSION:

In this research work, we examined the association between the level of Apelin-13 and bone mineral density and some other parameters for the determination of the impact of Apelin-13 on the osteoporosis among patients suffering from T-2DM. There are some research works in this particular literature. It is clear that the patients suffering from T-2DM are present with high danger to have fracture. But some research works showed that patients

appeared with normal or high bone mineral density [6]. The complications due to diabetes may cause high fall risk and fractures among these patients, the most important reason has its association with the BMD value [12]. In this research work, we discovered that Apelin-13 level in the groups of osteoporosis & osteopenia was much low as compared to the normal group. Additionally, PINP as an osteoblast derived protein is the biological response identifier in the duration of the osteoporosis treatment [13]. ICTP can be a sensitive identifier of bone resorption in-vivo [14].

In this research work, we assessed the association between Apelin-13, PINP & ICTP to identify the impact of Apelin-13 on the occurrence of osteoporosis. We discovered a strong association between all these 3 parameters. This finding showed that Apelin-13 is a strong biological marker for the supervision of the bone formation. In one research work conducted on 40 patients suffering from T-2DM by Zhang and his companions discovered that there is a close association of osteoporosis with the sex, body mass index, and course of disease and level of glucose [15]. On other research work conducted on eighty seven patients suffering from DM, Wang discovered that among groups of controls & osteoporosis, there was much difference in sex, age, body mass index and disease course [16].

In this research work, we discovered that there was significant disparities in sex and age of the patients but not in course of disease, body mass index in all 3 groups of study. The view point of various research works showed different parameters because of the methodology and size of samples selected in that work. Additionally we discovered that Apelin-13 level was with no relation to age, showing the osteoporosis risk may be increase with age, this finding is consistent with many research works of past [17].

There are some limitations of this research work as we found only the close association of different parameters but there were unclear mechanisms. Only the patients suffering from the DM were the participants. The size of the recruited samples was very low and most of the comparisons showed no significance and research works with a large sample size can provide different results.

CONCLUSION:

This research work concluded that there was a strong association between bone mineral density, Apelin-13, PINP & ICTP, proposing that there is an important role of Apelin-13 in the prevalence of the osteoporosis among patients suffering from T-2DM.

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