Original Article

Association of Hyperuricemia with Chronic Low Back Pain

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Abstract

Background: *The Back pain affects about 20% of the population in Bangladesh in each year between the ages of 30-60 years. A well-defined pathology is identified in only about 15% of patients.* ***Objective:*** *To identify the association of hyperuricemia in patients with chronic low back pain.* ***Materials and Methods:*** *A descriptive cross-sectional study was performed on 180 patients among the ages of 18 to 75 years with chronic low back pain (CLBP). Data was collected through a structured questionnaire. X-rays and Magnetic Resonance Imaging (MRI) of the lumbosacral spine had been used to evaluate any findings in terms of low back pain. Serum uric acid (sUA) levels had been tested and recorded.* ***Results:*** *Joint pain ($p < 0.001$), lumbar disc prolapse ($p = 0.023$), and disc degeneration ($p = 0.011$) were more in High-sUA than Low-sUA group. Female patients in H-sUA group had significantly higher occurrence of joint pain($p = 0.002$), lumbar disc prolapse ($p = 0.019$), and disc degeneration ($p = 0.004$) than L-sUA group. In regression analysis, female sex ($p = 0.036$), duration of CLBP ($p = 0.031$), and sUA level ($p = 0.025$) were associated with radiological findings. In female patients association of duration of CLBP ($p = 0.046$) and sUA ($p = 0.009$).* ***Conclusion:*** *The serum UA level was significantly associated with CLBP in female patients. More studies are warranted to explore whether the two conditions exist simultaneously or there is a direct causal relationship between the conditions.*

Key words: *Low back pain, Hyperuricemia, Serum uric acid (SUA), Spinal gout.*

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Introduction

Chronic low back pain is a common symptom experienced by greater than 80% of people at some point of their lives.[1] It causes a great health problem worldwide leading to financial burden of the patients in terms of remedy cost and the subsequent effect on job performance. It is defined as pain and discomfort, situated below the costal margin and above the inferior gluteal folds. If it persists for at least 12 weeks, it is defined as CLBP.[2] In 7% to 10% of cases, LBP becomes chronic.[3] The lower back pain may also radiate toward the legs and may be related to joint pain of the lower limbs. It is possible to establish a well-defined pathology in only about 15% of patients.[2] Back pain affects about 20% of the population in Bangladesh in each year between the age group 30-60 years, though a fairly common health problem, risk factors have not been completely elucidated.[4,5]

The presence of joint pain may be a result of underlying hyperuricemia, which manifests as inflammation of joints causing joint pain. Hyperuricemia is a higher level of serum uric acid that happens because of insufficient protein metabolism. The normal level of serum uric acid is 3.4-7.2 mg/dL (200-430 µmol/L) for male and 2.4-6.1 mg/dL (140-360 µmol/L) for female.[6,7] About 10% of the population with hyperuricemia develop gout, that is monosodium urate crystal deposition disease in and around large joints. According to a nearby study, the prevalence of gout is higher in patients over 50 years of age with a male predominance.[8,9] Risk factors for developing hyperuricemia and consequent presentation of gout

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are associated with increased life span, dietary and lifestyle changes, and presence of comorbidities.[10,11] Gout commonly affects the peripheral joints of the appendicular skeleton, and very rarely affects the axial joints. Spinal gout is diagnosed lately and is related to spinal cord compression, lumbar disc degeneration and osseous erosion leading to persistent lower back pain.[12] It commonly involves the posterior spinal segment, para spinal soft tissues, the intervertebral disc and the sacroiliac joint.[13,14]

The use of Magnetic Resonance Imaging (MRI) for radiological evaluation yields homogeneous, intermediate to low signal on T1 weighted photographs and variable signal intensity on T2-weighted photographs.[15] This study aims to assess hyperuricemia in patients presenting with persistent lower back pain with respect to gender, age and correlated with radiological findings.

Materials and Methods

An overall of 180 patients aged 18 to 75 years both male and female with chronic low back pain had been selected to participate on this cross-sectional study. They were recruited from the Outpatient Department, Private chamber from August 2019 to February 2020. A precise history was taken from all patients to find out the co morbidities like diabetes, hypertension, coronary heart disease, tuberculosis, chronic kidney disease, asthma, hepatitis and obesity. Low back pain was evaluated, keeping in sight its period and any associated radicular leg pain and joint pain of the lower limb. Imaging analysis of low back pain was done through X-rays and MRI of lumbo-sacral spine,trying to find out the important changes like - disc degeneration, disc prolapse, and joint space narrowing of the lumbar vertebrae. Serum uric acid analysis was performed via laboratory results in all of the patients. The normal level of serum uric acid was taken as 3.4-7.2 mg/dL (200-430 µmol/L) for male and 2.4-6.1 mg/dL (140-360 µmol/L) for female. Levels above the normal range had been taken into consideration increased and to establish any association with hyperuricemia. We excluded patients with spinal tuberculosis, inflammatory arthritis or seronegative Spondylo-arthropathy, previous back operation, history of trauma, patients currently using UA-lowering medication and low back pain due to renal cause. Patients were informed about study aim and procedures prior to inclusion in the study. Patients willing to participate in the study had provided written informed consent.

Continuous variables were normally distributed and were presented as mean ± standard deviation (SD). Categorical data were presented in number and percentage. Comparisons were determined by using independent sample Student's t test for two variables with continuous data. Chi-square test was used for comparison of variables with categorical data. Multivariable-adjusted association between radiographic severity of CLBP and the potential covariant variables were evaluated by logistic regression in male and female patients with CLBP. All data analyses had been performed using SPSS model 20.0. $P \leq 0.05$ was taken into consideration as statistically significant.

Results

Among the 180 patients, seventeen patients were excluded from the study according to exclusion criteria. A total data of 163 patients were obtained, among them 112 were females and 51 were male, the average level of sUA in the eligible patients was 5.6 ± 1.2 mg/dl.

Table I: Comparison of socio-demographic characteristics, clinical findings, and radiological findings between chronic low back pain patients in low serum uric acid group versus high serum uric acid group

	H-sUA group	L-sUA group	P value
Age	59.5 ± 6.87	59.7 ± 5.6	0.89*
BMI (kg/m2) (mean ± SD)	22.5± 1.6	22.4 ± 1.4	0.454 *
Duration of low back pain (years) (mean ± SD	10.4 ± 36	10.5 ± 3.2	0.468 *
Joint pain (n,%)	30, 69.8%	47, 39.2%	<0.001**
Lumber disc prolapsed (n,%)	22,51.2%	38, 31.7%	0.023**
Disc Degeneration (n, %)	25,58.1%	43, 35.8%	0.011**
Disc space narrowing (n,%)	18, 41.9%	48, 40.0%	0.831**

L-sUA (low serum uric acid), H-sUA (high serum uric acid), SD standard deviation, BMI (body mass index), IQR (interquartile range) * Student's t test, ** chi-square test. The significance level was set at $p \leq 0.05$

Table II: Comparison of socio-demographic characteristics, clinical findings, and radiological findings between female patients in low serum uric acid group versus high serum uric acid group.

	H-sUA group	L-sUA group	P value
Age (years) (mean ± SD)	59.5 ± 6.6	59.4 ± 5.7	0.971 *
BMI (kg/m2) (mean ± SD)	22.6 ± 1.7	22.8 ± 1.4	0.548 **
Duration of CLBP (years) (mean ± SD)	10.8 ± 3.7	10.7± 3.1	0.735 *
Joint pain (n,%)	17, 73.9%	33, 37.1%	0.002**
Lumber disc prolapse (n,%)	13, 56.5%	27, 30.3%	0.019**
Disc Degeneration (n,%)	17, 73.9%	36, 40.4%	0.004**
Disc space narrowing (n,%)	8, 34.8%	28, 31.5%	0.761**

L-sUA (low serum uric acid), H-sUA (high serum uric acid), SD (standard deviation), BMI (body mass index), IQR (interquartile range) * Student's t test, ** chi-square test. The significance level was set at $p \leq 0.05$

Table III: Comparison of socio-demographic characteristics, clinical findings, and radiological findings between male patients in low serum uric acid group versus high serum uric acid group

	H-sUA group	L-sUA group	P value
Age (years) (mean ± SD)	59.7± 7.1	60.4 ± 6.5	0.704*
BMI (kg/m2) (mean ± SD)	23.1± 1.6	22.6 ± 1.6	0.513*
Duration of CLBP (years) (mean ± SD	9.8± 3.7	10.12 ± 3.5	0.788*
Joint pain (n,%)	13, 65.0%	14, 45.2%	0.166**
Lumber disc prolapse (n,%)	9, 45.0%	11, 35.5%	0.497**
Disc Degeneration (n,%)	8,40.0%	7, 22.6%	0.183**
Disc space narrowing (n,%)		20, 64.5%	0.304**

L-sUA (low serum uric acid), H-sUA (high serum uric acid), SD (standard deviation), BMI (body mass index), wi, IQR (interquartile range), * Student's t test, ** chi-square test. The significance level was set at $p \leq 0.05$

Table IV: Multivariate regression analysis for factors associated with disc degeneration patients with CLBP.

	Unstandardized coefficients		Standardized Coefficients Beta	T	P
	Std. error	B			
In CLBP patients (Constant)	2.934	−5.767		−1.965	0.052
Age	0.138	− 0.26 2	−0.174	−1.903	0.061
Sex	0.134	- 0.28 2	−1.217	−2.135	0.036
BMI	0.049	0.037	0.067	0.748	0.455
Duration	0.062	0.136	0.203	2.189	0.031
SUA	0.073	0.166	1.291	2.270	0.025

Table V: Multivariate regression analysis for factors associated with disc degeneration in female patients with CLBP.

	Unstandardized coefficients		Standardized Coefficients Beta	T	P
	Std. error	B			
In CLBP patients	1.851	0.242		- 0.13 1	0.89 8
Age	0.14 2	0.26 3	0.175	1.852	0.06
BMI	0.04 8	0.04 6	0.091	0.957	0.34 2
Duration	0.14 1	−0.284	−0.18 8	−2.030	0.046
SUA	0.062	0.166	0.248	0.248	0.009

On radiological and clinical examination, patients in H-sUA group more often showed lumbar disc prolapse (51.2% vs. 31.7% respectively), joint pain (69.8% vs. 39.2% respectively) and disc degeneration (58.1% vs. 35.8% respectively) than L-sUA group. These variations had been significant ($p = 0.023$, $p < 0.001$, and $p = 0.011$ respectively) (Table I).

The female patients of H-sUA group more often displayed joint pain (73.9% vs. 37.1% respectively), lumbar disc prolapse (56.5% vs. 30.3% respectively), and disc degeneration (73.9% vs. 40.4% respectively) than patients in L-sUA group. These variations had been significant (p = 0.002, p = 0.019, p = 0.004 respectively) (Table II).No significant difference was found as regards the clinical or imaging findings between the male patients in H-sUA group in comparison to L-sUA group (Table III). The multivariable-adjusted associations with the severity of CLBP shown in Tables IV and V. the factors that confirmed considerable affiliation with CLBP were sex (p = 0.036), period of CLBP (p = 0.031), and sUA level (p = 0.026). For female patients with CLBP a considerable affiliation among period of CLBP (p = 0.045) and sUA (p = 0.009) was observed.

Discussion

Hyperuricemia is raised level of uric acid in the blood which can arise because of faulty protein metabolism. The normal level of serum uric acid is 3.4 -7.2 mg/dL (200-430 µmol/L) for man and 2.4-6.1 mg/dL (140-360 µmol/L) for woman[6,16,17] Hyperuricemia has been observed to correlate with co-morbidities including cardiovascular diseases, nutritional factors, genetic factors, alcohol consumption, metabolic syndrome (which includes high blood pressure and obesity), diuretic use and renal disease.[10,11,17,18]

Many factors can make a contribution to the onset of low back pain. In our study we give emphasis on the corresponding serum uric acid levels to access hyperuricemia in low back pain patients. The consequence of the current study found out that CLBP patients in H-sUA group had notably more severe radiological changes and clinical findings. On clinical and radiological examination, patients in H-sUA group more often show joint pain, lumbar disc prolapse and disc degeneration patients in L-sUAgroup. This observation has concluded that CLBP patients with higher sUA level more likely to have more severe MRI findings, in agreement with our findings. Although the diagnostic accurancy of computed tomography for assessing spinal gout is more than Magnetic Resonance Imaging (MRI), we have included both X-rays and MRI evaluation of the lumbo-sacral spine because of economic constraints of the patients.[19,20]

In our study, patients who has hyperuricemia had joint space narrowing of the lumbo sacral vertebrae on MRI scans, as become visible by Bloch et al.[7]Another study by Michael et al. shows that joint space narrowing causes clinical low backpain.[21] The common presentation of joint pain has a extensive affiliation with hyper uricemic low back pain patients in our observation. About 81% of the patients with hyperuricemia present with pain in the meta tarsophalangeal and knee joints, as concluded by Rukmini et al.[22] This may be defined by the presentation of gouty arthritis that results in developing joint pain.[23]

Next, we have labeled the patients that participated on this study into gender-based subgroups to decide whether or not gender contributes to the unfavorable outcomes of sUA on CLBP. Our results has confirmed that female patients with CLBP in H-sUA group has considerably more severe radiological findings. Female patients with CLBP in H-sUA group more often manifest with joint pain, disc degeneration and lumbar disc prolapse than patients in L-sUAgroup. In contrast, there have been no such big differences regarding clinical and radiological findings among male patients with CLBP in H-sUA group compared to L-sUAgroup.

The present study has a few limitations. The study has covered 163 sufferers with CLBP. This is the relatively small sample size and may increase the possibility of type II error. Hence, more research on large sample sizes is essential to verify the generalizability of the findings acquired through the existing study. Elevated sUA levels is a component of metabolic syndrome and for this reason, abdominal obesity is more relevant to CLBP and hyperuricemia rather than BMI. Abdominal obesity and hyperuricemia are strongly associated with a sedentary lifestyle. Exploring of the viable link among other confounding elements such as abdominal obesity is warranted. In the present study, we have categorized our patients according to the solubility point of sUA and accordingly, at this cut off point sUA level become notably related to CLBP severity in female patients, however not in male patients possibly suggesting that adult males might also additionally has a different cut off point; that is an area of future study. The possible ability of sUA reducing drugs in hindering CLBP development needed to be explored.

Conclusion

Higher sUA level is related to higher clinical severity, more Xray and MRI findings in patients with CLBP. Our results also indicated that sUA level was notably related to CLBP severity in female patients, but now no longer in male patients. More research are warranted to discover whether or not the two situations exist concurrently or there's an immediate causal courting among the two.

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