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Impact of Snail and Mussel Consumption on Hydroxyproline Levels and Clinical Parameters in Arthritis Patients

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Abstract: ***This study evaluates the serum hydroxyproline levels in arthritis patients compared to individuals who consume snails and mussels. It involved 100 participants, with 50 having arthritis (Group A) and 50 non-arthritis (Group B) individuals consuming snails and mussels. The biomarker especially hydroxyproline (HP) and clinical parameters viz. haemoglobin (Hb), total cholesterol (TC) and random blood glucose (RBG) were also estimated for group A and group B separately. The biomarker HP (pg/ml), TC and RBG (mg/dl) were significantly (P<0.0001) decreased in group B (1.1 ± 0.2, 149.4 ± 18.3 and 117.5 ± 8.4) when compared to group A (2.3 ± 0.4, 281.3 ± 58.6 and 188.0 ± 54.0). The Hb (%) was significantly (P<0.0001) increased in group B (12.2 ± 0.6) when compared to group A (11.5 ± 1.0). Key findings include significant differences in hydroxyproline levels and other clinical parameters between the two groups, suggesting potential benefits of these natural products in managing arthritis.***

Keywords: Osteoarthritis, Hydroxyproline, Biomarker, Clinical parameters, snails and mussels, OA management

1. Introduction

The clinical and radiologicalevidence are inadequate to diagnose early-stage osteoarthritis (OA)and also to predict disease progression. The biomarkers that assistingclinicians in initial diagnosis, assessing disease activity, predicting prognosis, and supervising response to medication.[1]

Generally, chondrocytes and extracellular matrix (ECM) are made up the articular cartilage. In the case of common cartilage, ECM is in a state of active balance between collagen synthesis and breakdown. This equilibrium gave in the favour of proteolysis in rheumatic arthritis (RA) and OA disorders, which is linked to pathologically cartilage loss.[2]It is well-known fact that the major enzymes are responsible for this destruction and collagen degradation, which are matrix metalloproteinases (MMPs) and secreted by chondrocytes.[3,4] For the reason that MMP-3 is produced by synovial fibroblasts of rheumatoid joints, not created by normal synovial cells, it has been asserted that it is a sign of synovitis coming from the joint.[5,6]

On the other hand, hydroxyproline (HP) is one of the specific amino acids found in collagens, which act as MMP substrates. The measurement of HP can be suitable for the diagnosis and prognosis of diseases caused by problems with collagen metabolism.[7] It was noted that several individuals with early disease symptoms did not meet diagnostic criteria for any of the diseases, posing a trouble in disease prevention and management. As evidence, Elbeialy et al.[8]reported thatthis biomarker could help to identify the disease in their early stages.

According to Golub et al.,[9] collagen is a protein, whichis comprising three polypeptide chains twisted in a spiral bonding and for the strength of collagen, the hydroxyl group of oxyproline are concerned to form the hydrogen bonds between polypeptide chain. The peculiarity of collagen is that about 14% of amino acids contained in it, which are known as oxyproline, an amino acid that is not contained in other proteins. In this regard, the content of oxyproline in serum was applied to assess collagen metabolism in the body.

El Beialyet al.[10] estimated serum level of HP in early RA patients compared to control subjects. They found hydroxyproline ranged in the RA patients' group is 1-24.9 pg/ml with mean of 4.81±6.89pg/ml while HP ranged in the control group is 1.4-6.73 pg/ml with mean of 4.52±1.55pg/ml. When comparing the RA patients with the control subjects, there was not statistically significant (p=0.857) difference between groups according to HP level.

Interestingly, freshwater snail (*Viviparous bengalensis*) an Indian gastropod, which is consumed by the village people for the prevention of several ailments. Moreover, in Indian and Chinese folk medicine, it has been mentioned that snail can increase the strength of bone and prevents joint disorders.[11] Prabhakar and Roy[12]reported that the flesh of *Bellamia (Viviparous*) *bengalensis* is used as a traditional medicine against arthritis in the people of north Bihar.

In an experimental *in vivo* approach with rat model revealed that ankle/knee swellings were significantly reduced after treatment with *Viviparous bengalensis* flesh extract (VBE) (1 and 2 $g{\cdot}kg^{-1}$, p.o. × 15 day)in OA groups. VBE (1 & 2 $g{\cdot}kg^{-1}$) treated groups showed 53.64% ± 5.13% and 62.17% ± 6.09% reduction of urinary hydroxy-proline (OH-P) in animals.[11]

In the present study, it was attempted to estimate the level of serum hydroxyproline in arthritis patients compared to subjects who consumed snails.

2. Materials and Methods

Study groups

In the present study, subjects were included and categorised into 2 groups. Among total 100 participant, 50 patients of arthritis as group A and fifty subjects as who were consumed snail and mussels as group B.

Biomarkerfor arthritis

As per history of inflammatory joint disorders in patients, the biomarker especially hydroxyproline (HP) for group A and group B separately were estimated.The HP concentration was expressed in terms of pg/ml by using Kit.

Clinical parameters

The clinical parameters such as haemoglobin (Hb), total cholesterol (TC) and random blood glucose (RBG) were also estimated separately for group A and group B participants by using standard protocol.

Statistical analysis

Categorical variables were taken and expressed in percentage frequency distribution and continuous variable expressed as Mean ± SD and comparison were made between group A and group B patients as per student 't' test by using statistical tool. P value less than 0.05 considered as significant.

3. Results

Table 1 evaluates the frequency distribution of hydroxyproline (HP) in serum of group A and B participants. In group A, all the patients were observed >1.5 pg/ml (50, 100.0%) while in group B, all the subjects were observed <1.5 pg/ml (50, 100.0%) of serum HP.

Table 1: Hydroxyproline distribution

Hydroxyproline (pg/ml)					
Group A	Frequency	%	Group B	Frequency	%
<1.5	0	0.0	<1.5	50	100.0
>1.5	50	100.0	>1.5	0	0.0
Total	50	100.00	Total	50	100.00

Table 2 evaluates the frequency distribution of haemoglobin (Hb) in bloodof group A and B participants. In group A, majority of patients were observed >10% (49, 98.0%) while in group B while only 1 case (2.0%) of <10% of Hb but all the subjects were observed >10% (50, 100.0%) of Hb in group B.

Table 2: Haemoglobin distribution

Haemoglobin (%)					
Group A	Frequency	%	Group B	Frequency	%
<10	1	2.0	<10	50	0.0
>10	49	98.0	>10	0	100.0
Total	**50**	**100.00**	**Total**	**50**	**100.00**

Table 3 evaluates the frequency distribution of total cholesterol (TC) in bloodof group A and B participants. In group A, majority of patients were observed >200 mg/dl (45, 90.0%) while in group B while only 5 cases (10.0%) of <200 mg/dl of TC but all the subjects were observed >200 mg/dl (50, 100.0%) of TC in group B.

Table 3: Total cholesterol distribution

Total cholesterol (mg/dl)					
Group A	Frequency	%	Group B	Frequency	%
<200	5	10.0	<200	50	100.0
>200	45	90.0	>200	0	0.0
Total	50	100.00	Total	50	100.00

Table 4 evaluates the frequency distribution of Random blood glucose(RBG) in bloodof group A and B participants. In group A, majority of patients were observed >140 mg/dl (36, 72.0%) while in group B while only 14 cases (28.0%) of <140 mg/dl of RBG but majority of the subjects were observed <140 mg/dl (34, 68.0%) and minimum of >140 mg/dl (16, 32.0%) RBG in group B.

Table 4: Random blood glucose distribution

Random blood glucose (mg/dl)					
Group A	Frequency	%	Group B	Frequency	%
<140	14	28.0	<140	34	68.0
>140	36	72.0	>140	16	32.0
Total	50	100.00	Total	50	100.00

Table 5evaluates comparative analysis of mean ± SD of HP and clinical parameters such as Hb (%), TC (mg/dl) and RBG (mg/dl) between arthritis patients (group A) and snails and mussels consumed (group B) subjects. For HP (pg/ml), a highly significant (P<0.0001) decreased level was observed in group B (1.1 ± 0.2) when compared to group A (2.3 ± 0.4). For Hb (%), a highly significant (P<0.0001) increased level was observed in group B (12.2 ± 0.6) when compared to group A (11.5 ± 1.0). For TC (mg/dl), a highly significant (P<0.0001) reduction was observed in group B (149.4 ± 18.3) when compared to group A (281.3 ± 58.6). For RBG (mg/dl), a highly significant (P<0.0001) reduction was observed in group B (117.5 ± 8.4) when compared to group A (188.0 ± 54.0).

Table 4.3.5: Comparative analysis of mean Hydroxyproline and clinical parameters between arthritis patients and snails & mussels consumed subjects

Parameters (Mean ± SD)	Group A (n = 50)	Group B (n = 50)	P-value
HP (pg/ml)	2.3±0.4	1.1±0.2	0.0001
Hb (%)	11.5 ± 1.0	12.2 ± 0.6	0.0001
TC (mg/dl)	281.3 ± 58.6	149.4 ± 18.3	0.0001
RBG (mg/dl)	188.0 ± 54.0	117.5 ± 8.4	0.0001

4. Discussion

Generally, HP was found non-RA group 1.4-6.73 pg/ml while it is exceeded in increased level in RA patients. Moreover, our study participants were OA group and snails consumed subjects, which indicated lower value.

In a study by El Beialy et al. [10] estimated serum level of HP in early RA patients compared to control subjects. They found HP ranged between 1-24.9 pg/mlin the RA patients' group, which was higher levelwhen compared to the control group (1.4-6.73 pg/ml).

In a recent study by Elbeialy et al. [8] revealed that HP is a new biomarker fordifferentiating OA from RA in the early stages of patients. On the other hand, a highly significant ($P<0.0001$) decreased level was observed in group B (1.1 ± 0.2) i.e., snail consumed subjects when compared to group Aas arthritis patients (2.3 ± 0.4).

Prabhakar and Roy [12]reported that the flesh of *Bellamia (Viviparous*) *bengalensis* is used as a traditional medicine against arthritis in the people of north Bihar. In another experimental study by Sarkar et al. [11] reported that an*in vivo* method with rat model with OA groups, ankle/knee swellings were significantly reduced after treatment with *Viviparous bengalensis* flesh extract (VBE) (1 and 2 $g \cdot kg^{-1}$, p.o. × 15 day). VBE (1 & 2 $g \cdot kg^{-1}$) treated groups showed 53.64% ± 5.13% and 62.17% ± 6.09% reduction of urinary hydroxy-proline (OH-P) in animals. Our study confirms that snail consumed patients did not show OA. Our study also stated that there was improved the clinical parameters those who had consumed snails.

5. Conclusion

This study reveals a significant correlation between snail and mussel consumption and lower prevalence of arthritis, as evidenced by hydroxyproline levels and other clinical parameters. These findings suggest a potential role for these natural products in preventing arthritis, highlighting their anti-inflammatory and immune-modulatory properties.

Conflict of interest
Authors declare no conflict of interest.

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References

[1] Benedetti S, Canino C, Tonti G, Medda V, Calcaterra P, Nappi G, et al. Biomarkers of oxidation, inflammation and cartilage degradation in osteoarthritis patients undergoing sulfur-based spatherapies. ClinBiochem. 2010;43:973-8.
[2] Kevorkian L, Young DA, Darrah C, Donell ST, Shepstone L, Porter S, et al. Expression profiling of metalloproteinases and their inhibitors in cartilage. Arthritis Rheum. 2004;50(1): 131-41.
[3] Murphy G, Nagase H. Progress in matrix metalloproteinase research. Mol Aspects Med. 2008;29(5):290-308.
[4] Bonnans C, Chou J, Werb Z. Remodelling the extracellular matrix in development and disease. Nat Rev Mol Cell Biol. 2014;15(12):786-801.
[5] Murphy G, Knauper V, Atkinson S, Butler G, English W, Hutton M,et al. Matrix metalloproteinases in arthritic disease. Arthritis Res. 2002;4 Suppl3:S39-S49.
[6] Posthumus MD, Limburg PC, Westra J, van Leeuwen MA, van Rijswijk MH. Serum matrix metalloproteinase 3 in early rheumatoid arthritis is correlated with disease activity and radiological progression. J Rheumatol. 2000;27(12):2761-8.
[7] Hofman K, Hall B, Cleaver H, Marshall S. High-throughput quantification of hydroxyproline for determination of collagen. Analytical Biochemistry. 2011;417(2):289-91.
[8] Elbeialy A, Elabd H, Shahen A, Amin R. Hydroxyproline as a new biomarker to differentiate osteoarthritis from rheumatoid arthritis in the early stages. Preprint Research Square, 2022.
[9] Golub YV, Purygin PP, Samorodov AV. Hydroxyproline content in blood serum of patients with rheumatoid arthritis. AIP Conference Proceedings. 2022;2390(1):030025.
[10] El BeialyAA, Elabd HA, Abd El-Rahman AFI. Serum level of matrix metalloproteinase 3 and hydroxyproline in patients with early rheumatoid arthritis. The Egyptian Journal of Hospital Medicine. 2019;77(6): 5776-83.
[11] Sarkar A, Datta P, Gomes A, Das Gupta SC, Gomes A. Anti-osteoporosis and anti-osteoarthritis activity of fresh water snail (*Viviparous bengalensis*) flesh extract in experimental animal model. Open Journal of Rheumatology and Autoimmune Diseases. 2013;3(1):27838.
[12] Prabhakar AK, Roy SP. Ethno-medicinal uses of some shell fishes by people of Kosi River Basin of North-Bihar, India. Ethnomedicine. 2009;3(1):1-4.