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Original Article

Status of oxidative stress, antioxidants, and liver function tests among Nepalese workers from Gulf countries and Malaysia

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ABSTRACT

Introduction: Nepalese migrants to the Gulf countries and Malaysia are prone to poor health because of their low status as migrants, challenging living and working conditions, changes in lifestyle, and inadequate access to health care. The main aims of this study were to assess the status of oxidative stress, antioxidants, and liver function among Nepalese workers from Gulf countries and Malaysia.

Methods: A descriptive cross-sectional study was conducted among 332 Nepalese migrant workers to Gulf countries and Malaysia arriving at Tribhuvan International Airport during May 15 and June 15, 2019. Data was collected using a structured questionnaire, anthropometric measurements, and venous blood sample to access the status of oxidative stress, antioxidants, and liver function. Blood samples were analyzed at the laboratory of Janamaitri Foundation Institution of Health Sciences.

Results: Results revealed that 5% had an abnormal liver panel test. The mean value for Serum Malondialdehyde (MDA) was 1.57± 1.25 µmol/L while 38.8% had an increased level of MDA. The mean value for total Protein was 7.19 ± 0.97 gm %, albumin was 4.43 ± 0.75 gm %, and Albumin/ Globulin Ratio was 1.8. There was a significant difference in MDA, SOD, and A/G ratio among migrant workers as per country of work.

Conclusion: Nepalese migrant workers in Gulf countries and Malaysia are vulnerable to developing liver diseases. The high levels of serum MDA among Nepalese migrant workers is an important concern for the health care system. Thus, strengthening policy for regular health screening among these migrant workers is warranted.

Keywords: Gulf Countries, Liver Function, Nepalese Migrant Workers, Oxidative Stress

Introduction

The population movement is one of the defining phenomena of the present time. In today's world characterized by economic disparities, easily transmissible information, and convenient travel, more individuals are willing to relocate in pursuit of better living circumstances for their family and themselves.[1] According to the International Labor Organization (ILO), the vast majority of international travelers worldwide are migratory workers, and movement is primarily motivated by work/employment.[2] In the context of Nepal, international labor migration is not a recent phenomenon; the majority of the migrants are going to the Gulf States, Malaysia, and other Southeast Asian nations. Surprisingly, the pattern of foreign labor migration has evolved to the point where it has replaced Nepal's agricultural economy with one centered on remittances.[3] Armed conflict, declining agricultural production, poverty, and a lack of job opportunities are some of the factors driving international labor migration.[4]

Because of their low status, subpar housing

circumstances, limited health care, and lack of community cohesion, migrants are frequently at risk. Thus, the health risk for migrant workers is increased by both contextual and individual variables.[5] Furthermore, several Nepali migrant workers have lost their lives in the Gulf owing to workplace- related accidents, mental health issues (including suicide), and unfavorable working circumstances (such as a lack of formal labor relations and safety standards). Heart attacks, respiratory disorders, renal failure, automobile crashes, and suicides claimed the lives of Nepalese laborers in Qatar. [6] Of all the immigrants who died in Malaysia or one of the GCC nations, the overwhelming majority were migrant workers (97% male and 75% female). Cardiac arrest, heart attacks, suicide, natural death, road accidents, workplace accidents, and other unknown reasons are among the main causes of death.[7] The burden of chronic liver disease in migrant communities worldwide is rising as a result of the absence of universal standards for screening, vaccination, and treatment of viral hepatitis.[8] Moreover, liver illness is significantly more common among immigrants of Gulf nations.[9] Thus, assessment of liver function is important.

Additionally, the frequency of obesity is rising across the Gulf region. Among obese people, oxidative stress has been found to be correlated with increased inflammation.[10] Oxidative stress occurs when an increased generation of free radicals exceeds the antioxidant system, which maintains the organism's homeostasis.[11] Free radicals/reactive oxygen species (ROS) are produced due to radiation, pollution, tobacco smoke, pesticides, a diet high in sugar and fat, alcohol, and ozone which cause oxidative stress.[12] Oxidative stress is a pathogenic process that contributes to the onset and progression of liver injury. Oxidants that are easily tested in blood or plasma include hydrogen peroxide, superoxide radical, oxidized glutathione (GSSG), MDAs, isoprostanes, carbonyls, and nitrotyrosine. The function of antioxidants is to counterbalance the effects of oxidants. These can be classified into enzymatic and non-enzymatic: SOD, catalase, GTPx, GST and vitamin A, vitamin C, and vitamin E, respectively.[13] Antioxidants predominate in healthy tissues; maintain the oxidant/antioxidant balance. Disruption of this equilibrium leads to tissue and other degenerative illnesses.[14]

As the immigration rate is increasing term in the context of Nepal, the health issues of citizens are an important prospect to be monitored. Thus, the study aims to assess the status of oxidative stress, antioxidants, and liver function in Nepalese workers from Gulf countries and Malaysia.

Methods

This analysis is a section of a larger study of lifestyle and health (mental as well as physical health) of Nepalese migrant workers. The University Grant Commission Nepal awarded a Faculty Research Grant (UGC Award number, FRG-74/75/HS-07) for this study. A descriptive cross-sectional design was adopted for this study. All Nepalese migrant workers who arrived at Tribhuvan International Airport (TIA) between May 15 and June 15, 2019, and who agreed to participate, were included in the research. These migrant workers must have worked in any occupation for at least six months in Gulf nations or Malaysia. Migrant workers who had consumed alcohol and were not willing for blood sample collection were excluded from the study. In total, 332 migrant workers consented to participate. Structured questionnaires were used to collect socio-demographic information. Height and weight were measured, and BMI was calculated. The Blood sample collection center was set within the arrival section of TIA. The blood sample was collected by venipuncture in a gel vial. From each participant, 5ml of blood was drawn. All collected samples were transported in an icepack to the department of medical laboratory technology, Janamaitri Foundation Institute of Health Sciences, Balaju, Kathmandu. Clotted samples were centrifuged at 3000 rpm for 15 minutes. Later, serum was transferred into cryovials, labeled as designated, and stored at -20 °C until analysis. Samples were thawed at room temperature before analysis. Different tools like centrifuge machine, water bath, hot air oven, incubator, vials, as well as gel tube, analyticon biolyzer 100 analyzer, colorimeter, and spectrophotometer were used for analysis. A Liver function test was performed from a serum sample with analysis of oxidative stress markers. Antioxidant levels were analyzed through the colorimetric method. A Quality/Reference procedure was employed with appropriate controls/standards. Total serum protein by biuret method, Serum Albumin by Bromo-Cresol Green method, Total and Direct Serum Bilirubin by Jendrassik and Groff method, Glutamate pyruvate transaminase by UV Kinetic, Glutamate oxaloacetate transaminase by UV Kinetic/Reitman and Franks, Alkaline phosphatase by

Kinetic/modified Kings method, Malondialdehyde by Buege and Aust method Serum Catalase Activity as explained by Sinha. [15]

Data was analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0. Descriptive statistics, T-tests, ANOVA tests and correlation analysis were used for data analysis.

Nepal Health Research Council (NHRC) provided the ethical approval for the study. All participants provided written consent before data collection began. The goals and objectives of the study were explained to the participants. Participants were guaranteed confidentiality since their identities would not be disclosed. Also, it was explained that the obtained data would be used solely for research reasons. Social and cultural values were upheld.

Results

Among 332 participants majority of them (91.87%) were males whereas 8.13% were females. The majority of respondents (39.16%) had worked in Qatar and 35.84% had pre-obesity (Table 1).

A significant level of oxidative stress, which is 1.57±1.25, whereas lower levels of antioxidants (serum catalase 33.98± 16.02, superoxide dismutase 2.56±0.70) was seen among Nepalese workers from Gulf countries and Malaysia (Table 2).

There was a significant negative correlation of MDA with Superoxide Dismutase (r=-0.341, p>0.001) as well as Serum catalase (r=-0.219, p>0.001). While there was a significant positive correlation between antioxidants, Superoxide Dismutase with Serum catalase (r=0.177, p>0.001).

Table 1: Socio-demographic and body mass index (BMI) of Nepalese migrant workers (n=332)

Variables		Frequency (%)
Gender	Male	305 (91.87)
	Female	27 (8.13)
Age (in years)	up to 25	67 (20.18)
	26-30	71 (21.39)
	31-35	60 (18.07)
	36-40	69 (20.78)
	41-45	43 (12.95)
	46-50	13 (3.92)
	>50	9 (2.71)
	Total	332
Duration of Work (in years)	<4	153 (46.08)
	4-8	103 (31.02)
	9-12	46 (13.86)
	13-16	18 (5.42)
	>17	12 (3.61)
Country of Work	Qatar	130 (39.16)
	Saudi Arabia	77 (23.19)
	UAE	58 (17.47)
	Kuwait	26 (7.83)
	Malaysia	25 (7.53)
	Oman	12 (3.61)
	Bahrain	4 (1.20)
BMI	Under weight	22 (6.63)
	Normal BMI	161 (48.49)
	Pre obesity	119 (35.84)
	Obesity class 1	28 (8.43)
	Obesity class 2	1 (0.30)
	Obesity class 3	1 (0.30)

Table 2: Level of serum MDA, antioxidants, and liver function panels (n=332)

Parameter	Mean ± S.D	Within normal range	Abnormal range
Serum Malondialdehyde (µmol/L)	1.57 ± 1.25	203 (61.14)	129 (38.86)
Serum Catalase (KU/L)	33.98 ± 16.02	205 (61.75)	127 (38.25)
Superoxide Dismutase (U/ml)	2.56 ± 0.70	179 (53.92)	153 (46.08)
Serum Glutamate Pyruvate Transaminase (IU/L)	21.94 ± 12.12	327 (98.49)	5 (1.51)
Serum Glutamate Oxaloacetate Transaminase (IU/L)	27.56 ± 9.98	310 (93.37)	22 (6.63)
Alkaline Phosphatase (IU/L)	172.94 ± 93.02	312 (93.98)	20 (6.02)
Total Bilirubin (gm %)	0.57 ± 0.25	327 (98.49)	5 (1.51)
Direct Bilirubin (gm %)	0.18 ± 0.15	314 (94.58)	18 (5.42)
Total Protein (gm %)	7.19 ± 0.97	259 (78.01)	73 (21.99)
Albumin (gm %)	4.43 ± 0.75	244 (73.49)	88 (26.51)
Albumin/ Globulin Ratio	1.8 ± 0.76	109 (32.83)	223 (67.17)

Table 3 summarized ANOVA test results and found that there was a significant difference in A/G ratio as per the country of work. Similarly, there was a significant difference in direct bilirubin as per the BMI of the respondent.

Table 4 summarized ANOVA test results and found that there was a significant difference in MDA and SOD on the country of work. Similarly, there was a significant difference in catalase as per the occupation of the respondents.

Table 3: Difference in liver function tests among respondents as per selected study variable (n=332)

Variables		N	Total bilirubin	Direct bilirubin	Total protein	Albumin	A/G ratio
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Gender	Male	305	0.54±0.25	0.18±0.15	7.18±0.97	4.44±0.73	1.82±0.76
	Female	27	0.53±0.12	0.15±0.07	7.11±0.99	4.3±0.83	1.54±0.74
	p-value		0.276	0.351	0.611	0.217	0.691
Age in Years	up to 25	67	0.59±0.15	0.18±0.09	7.25±1.16	4.48±0.74	1.83±0.76
	26-30	71	0.58±0.18	0.18±0.11	7.10±0.95	4.35±0.76	1.79±0.78
	31-35	60	0.57±0.31	0.18±0.19	7.11±0.89	4.48±0.73	1.84±0.80
	36-40	69	0.61±0.36	0.20±0.22	7.13±0.95	4.38±0.69	1.81±0.76
	41-45	43	0.50±0.10	0.13±0.05	7.31±0.81	4.30±0.67	1.60±0.67
	46-50	13	0.51±0.12	0.14±0.06	7.57±0.93	4.88±0.84	1.97±0.79
	>50	9	0.46±0.14	0.13±0.05	7.36±1.01	4.63±1.11	1.87±0.79
	p-value		0.276	0.351	0.611	0.217	0.691
County of work	Qatar	130	0.57±0.29	0.18±0.17	7.28±0.93	4.51±0.72	1.83±0.76
	Saudi Arabia	77	0.58±0.22	0.17±0.12	7.03±0.95	4.4±0.79	1.82±0.72
	UAE	58	0.57±0.14	0.16±0.08	7.26±0.98	4.42±0.72	1.68±0.63
	Kuwait	26	0.52±0.13	0.15±0.08	7.25±0.94	4.12±0.80	1.41±0.49
	Oman	12	0.66±0.52	0.25±0.36	7.18±0.92	4.43±0.44	1.9±0.99
	Bahrain	4	0.6±0.53	0.15±0.10	7.37±1.49	4.35±0.35	2.17±0.95
	Malaysia	25	0.56±0.16	0.18±0.11	6.93±1.14	4.48±0.85	2.13±1.05
	p-value		0.798	0.608	0.483	0.417	0.027

Variables		N	Total bilirubin	Direct bilirubin	Total protein	Albumin	A/G ratio
			Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Occupation	Construction work	63	0.56±0.21	0.17±0.13	7.28±0.99	4.5±0.81	1.8±0.79
	Driving	49	0.58±0.38	0.18±0.23	7.25±0.87	4.5±0.73	1.79±0.69
	Wholesale and retail trade	39	0.56±0.16	0.17±0.10	7.27±1.22	4.36±0.72	1.81±0.86
	Agriculture and farm work	5	0.64±0.25	0.26±0.13	7.12±0.85	4.24±0.45	1.67±0.69
	Household work	49	0.53±0.12	0.15±0.08	7.32±0.91	4.33±0.81	1.56±0.58
	Hotel and restaurant work	34	0.58±0.20	0.18±0.09	7.06±1.0	4.53±0.81	1.93±0.63
	Security	11	0.77±0.54	0.3±0.37	6.87±0.92	4.51±0.67	2.11±0.90
	Clerical work	30	0.5±0.12	0.14±0.06	7.25±0.79	4.48±0.77	1.83±0.81
	Electrical work	15	0.62±0.37	0.2±0.17	6.84±1.23	4.06±0.62	1.55±0.76
	Maintenance/ Mechanic/ Mechanical plant	21	0.58±0.20	0.18±0.15	7.06±0.85	4.38±0.47	1.78±0.61
	Glass/metal and other factory	16	0.63±0.17	0.19±0.08	6.99±0.95	4.48±0.68	2.24±1.10
	p-value		0.21	0.228	0.748	0.696	0.131
BMI	Under weight	22	0.6±0.14	0.17±0.07	7.06±1.15	4.51±0.89	2.02±1.02
	Normal weight	161	0.61±0.32	0.2±0.20	7.14±0.96	4.34±0.70	1.72±0.68
	Pre obesity	119	0.53±0.14	0.15±0.07	7.22±0.95	4.52±0.78	1.88±0.82
	Obesity class 1	28	0.48±0.10	0.13±0.054	7.5±0.95	4.51±0.72	1.7±0.63
	Obesity class 2	1	0.3±0	0.1±0	6.9±0	4.47±0	2.8000
	Obesity class 3	1	0.6±0	0.1±0	6.8±0	3.88±0	1.2600
	p-value		0.053	0.022	0.537	0.384	0.17

Table 4: Difference in liver function tests, MDA, SOD, Catalase among respondents as per selected study variable (n=332)

Variables		N	MDA	SOD	Catalase	SGPT	SGOT	ALP
			Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
Gender	Male	305	1.64±1.12	1.24±0.21	33.94±10.2	22.00±12.22	27.74±9.95	174.62±96.43
	Female	27	0.81±0.23	1.09±0.11	34.40±11.6	21.21±19.99	25.48±10.24	153.94±31.88
	p-value		0.651	0.409	0.887	0.748	0.259	0.269
Age in Years	up to 25	67	1.38±0.95	2.56±0.75	33.05±15.91	22.06±10.70	28.74±11.97	190.44±188.54
	26-30	71	1.59±1.24	2.57±0.61	34.47±15.63	24.62±19.61	27.54±9.3	162.99±39.32
	31-35	60	1.68±1.25	2.52±0.72	33.17±15.0	19.23±6.51	24.94±7.31	163.16±43.11
	36-40	69	1.53±1.29	2.67±0.72	33.31±15.78	22.15±9.01	28.83±10.47	172.82±45.72
	41-45	43	1.80±1.54	2.38±0.70	34.75±18.14	22.40±8.84	28.37±9.86	177.19±46.344
	46-50	13	1.59±1.70	2.36±0.63	39.56±21.56	17.62±8.15	23.40±7.71	158.57±20.34
	>50	9	1.22±0.82	2.70±0.61	35.68±10.37	20.09±9.65	28.73±11.73	187.56±54.55
	p-value		0.651	0.409	0.887	0.208	0.183	0.617

Variables		N	MDA	SOD	Catalase	SGPT	SGOT	ALP
			Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD	Mean±SD
County of work	Qatar	130	1.59±1.16	2.53±0.71	32.73±14.19	21.82±15.34	27.69±10.51	180.82±137.77
	Saudi Arabia	77	1.89±1.36	2.31±0.69	34.28±17.31	21.8±8.14	26.76±9.31	176.72±47.87
	UAE	58	1.46±1.24	2.7±0.73	37.06±17.54	22.02±9.54	28.3±10.66	158.24±38.89
	Kuwait	26	1.27±1.19	2.69±0.65	33.95±16.97	24.78±12.50	27.95±10.74	159.79±37.23
	Oman	12	1.19±1.27	2.75±0.53	39.64±17.84	23.5±12.50	27.94±11.72	173.38±25.28
	Bahrain	4	2.3±1.58	2.25±0.56	28.41±19.15	18.6±11.32	24.67±8.77	156.9±36.91
	Malaysia	25	1.07±1.16	2.85±0.70	30.6±14.71	19.51±7.49	27.42±6.03	170.39±58.37
	p-value		0.036	0.003	0.418	0.817	0.9760	0.791
Occupation	Construction	63	1.85±1.29	2.55±0.70	32.26±14.01	23.16±9.53	29.17±12.16	178.7±46.84
	Driving	49	1.76±1.35	2.5±0.64	33.97±14.93	24.53±22.18	28.41±8.42	176.49±45.53
	Wholesale, retail trade	39	1.36±1.06	2.46±0.58	36.32±16.43	20.22±8.67	26.5±8.29	167.46±43.47
	Agriculture and farm	5	1.36±2.03	2.73±0.72	59.83±25.50	20.42±9.71	32.94±8.90	181.1±50.11
	Household work	49	1.39±1.26	2.51±0.65	34.17±16.39	22.58±9.36	26.42±8.63	163.48±39.93
	Hotel, restaurant work	34	1.47±1.19	2.53±0.67	32.26±15.32	22.63±11.52	29.12±11.72	152.65±42.78
	Security	11	1.41±1.10	2.88±0.83	30.54±15.32	16.93±8.37	26.69±11.01	178.21±52.08
	Clerical work	30	1.44±1.15	2.63±0.84	32.55±13.92	19.71±6.49	25.38±8.35	169.13±44.17
	Electrical work	15	1.62±1.54	2.38±0.48	28.5±13.03	17.73±6.67	25.32±8.40	256.08±391.97
	Maintenance/ Mechanic/ Mechanical plant	21	1.53±1.20	2.7±1.05	40.29±19.53	23.76±12.10	28.79±12.72	165.32±30.65
	Glass/metal and other factory	16	1.57±1.22	2.64±0.56	31.89±18.43	19.5±6.15	24.79±8.10	157.46±39.82
	p-value		0.711	0.785	0.019	0.4590	0.519	0.12
BMI	Under weight	22	1.19±0.89	2.78±0.61	30.32±13.18	20.51±8.8	29.6±11.52	157.59±44.09
	Normal weight	161	1.54±1.22	2.55±0.69	34.6±15.5	22.74±14.789	27.24±9.74	164.41±44.25
	Pre obesity	119	1.74±1.38	2.53±0.72	33.91±17.53	21.37±9.22	27.46±10.24	186.31±143.54
	Obesity class 1	28	1.33±0.99	2.46±0.71	33.99±14.74	21.59±7.27	28.8±9.05	176.45±37.56
	Obesity class 2	1	2.33±0	2.34±0	34.56±0	15.12±0	26.2±0	147.4±0
	Obesity class 3	1	0.33±0	2.67±0	20.57±0	6.5±0	11.3±0	219.0±0
	p-value		0.256	0.672	0.838	0.665	0.523	0.447

Discussion

In Arabian nations, liver illness has been identified as one of the top 10 causes of disease-specific death.[16] Nonalcoholic fatty liver disease (NAFLD) is one of the most prevalent chronic liver illnesses.[17] Furthermore, as per the global epidemiology of NAFLD, the Middle East has the highest prevalence (32%).[18] An increasing prevalence of non-alcoholic fatty liver disease (NAFLD) is indicated by the rising risk factors, obesity, metabolic syndrome, and type 2 diabetes mellitus in this group.[19] NAFLD patients have higher levels of peroxidized lipids, including malondialdehyde (MDA), which is frequently utilized in clinical practice as an indicator of lipid peroxidation.[20] Furthermore, there is an anticipated rise in annual liver-related death rates by 270% in the United Arab Emirates and 295% in Saudi Arabia per year.[21] This is placing a substantial burden on the healthcare system's ability to manage related risk factors, and promptly screen, evaluate, diagnose, and refer patients to hepatologists.

One of the vital organs impacted by oxidative stress is the liver.[22] Oxidative stress mostly damages the parenchymal cells of the liver.[23] The

presence of excessive reactive ROS causes disturbance in homeostasis, resulting in oxidative stress, which is a primary cause of chronic and degenerative diseases, including liver illness.[24] In the current study, out of 332 immigrants, 129 (38.8%) had abnormal values for serum MDA levels, which is indicative of oxidative stress. Similarly, it was discovered that 127 patients (61.1%) had abnormal serum catalase levels, and 153 patients (46%) had abnormal serum superoxide dismutase levels, indicating decreasing amounts of antioxidants in the body. Table 2 indicates that only a few immigrants had deranged levels of liver enzymes and serum bilirubin levels. However, the serum albumin values of 88 (26.6%) and the serum total protein of 73 (22%) were abnormal. These findings might be the result of unhealthy lifestyle choices. The lifestyle pattern of these migrant workers from Nepal, which has been presented elsewhere, shows that over half of the respondents drank alcohol, 96.8% were not vegetarians, 69.3% never exercised, and 27.5% worked in very high temperatures (41-50 degree Celsius).[25] These unhealthy lifestyle choices place Nepalese migrant worker's health at threat. Taiwanese immigrants had higher serum MDA levels than non-immigrants in a comparative study, which may be a red flag for the healthcare system.[26] Another study conducted in Sweden also concluded the presence of oxidative stress as well as inflammation among immigrant women from Middle East countries living in Sweden.[27]

During their stay, immigrants had to deal with psychological, social, mental, and physical issues.[28] These issues could be the reasons for increasing levels of serum MDA and decreasing levels of serum antioxidants like SOD and Catalase. Proteins, lipids, and nucleic acids are among the macromolecules that can sustain direct damage from the ROS generated in the tissues. Chain reactions begin as soon as lipid peroxidation starts and continue until termination products are generated. Thus, end products of lipid peroxidation accumulate in biological systems, including malondialdehyde (MDA), causing damage to cells; hence, the body cannot nullify the damage caused by the production of MDA.[29]

A statistically positive correlation was observed between two antioxidants, serum catalase and SOD. It could be because of the similar location of origin and mechanism of action that is neutralizing the free radicals.[30]

Using ANOVA, we compared the various biochemical parameters (Total Bilirubin, Direct Bilirubin, Total Protein, Albumin, A/G ratio, MDA, Catalase, SOD, SGPT, SGOT and ALP) of participants with selected variables. Findings suggest that there is a significant difference in A/G ratio in the country of work, direct bilirubin as per the BMI of the respondents, MDA and SOD in the country of work, and catalase as per the occupation of the respondents.

Conclusions

This is one of the first studies conducted to assess the oxidative stress, antioxidants, and liver function test in Nepalese immigrants from Gulf countries and Malaysia. Nearly 40% of migrant workers had abnormal levels of MDA. Higher levels of MDA are linked with oxidative stress, which is not only a major factor in liver illnesses but also other chronic and degenerative disorders. Moreover, there are slight changes in a few parameters of liver function tests. This could be related to many hidden causes, like a hot and humid climate and unhealthy food habits, including dehydration. Further large-scale studies are warranted to get a clear insight on oxidative stress and its relationship with different contexts that Nepalese migrant workers to Gulf countries and Malaysia go through.

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