



The Impact of COVID-19 on Diabetes Mellitus and Hypertension: A Retrospective Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

COVID-19 is a pathogenic virus that caused a pandemic outbreak in December 2019. The impact of this virus may be severe in the patients having co-morbidities like diabetes, hypertension, Chronic Kidney Disease, cardiovascular disease, etc.

Aim and Objectives: This study Aims in Assessing the impact of COVID-19 on Diabetic and Hypertensive patients as well as COVID-19 patients without any co-morbidities. Objective of this is to evaluate the association between COVID-19 and its risk factors (diabetes and hypertension) and to evaluate whether the severity of the symptoms in COVID-19 patients is due to comorbidities or past medications.

Methodology: A Retrospective study was conducted in SRM Hospital (Medical Records Department) for a period of 3 Months with the study population 670 at the age group of 25, known case of Diabetes and Hypertension. Cases of Pregnant women are excluded from the study. The patients were grouped into 4 categories 1) control group (patient without any co-morbidities) 2) diabetic patients 3) Hypertensive patient 4) Diabetic+Hypertension patient and studied their prescribing pattern by collecting the past medication history.

Results and Discussion: There is a significant decrease in a lymphocyte in covid-19 Type 2 diabetic patients in our study. These results suggest that different mechanism exists for hypertension and diabetes mellitus as risk factors for covid-19. It is also known that these patients have impaired immune response to many infections [30]. In our retrospective study, we collected 670 covid-19 cases. It consists of 12.5% of diabetic patients and 6.6% of hypertensive patients. This study compared COVID-19 patients without any comorbidity (neither Type 2 diabetes mellitus nor hypertension) with covid-19 patients with comorbidities (Type 2 diabetes mellitus and hypertension). COVID-19 patients with T2DM have an increased level of D-dimer compared to non-T2DM patients. Conclusion: Diabetic and hypertensive patients affected with COVID-19 are low in our study. Out of the total study population, only 12.5% are diabetic, 6.56% are hypertensive, and 9.25% were both diabetic and hypertensive. But when comparing in terms of severity, hypertensive and diabetic patients have severe effects than the control patients. In simpler terms, not every person who has diabetes and hypertension are affected with COVID-19, but those who were affected by COVID-19 showed more severity than the patients who don't have any comorbidities

Keywords: COVID-19; hypertension; diabetes; clinical characteristics; outcomes.

1. INTRODUCTION

In December 2019, a pandemic outbreak occurred in China which spread all over the world that caused severe mortality and morbidity globally. World Health Organisation [WHO] named this novel virus COVID-19, a pathogenic virus. It is a positive-sense-single-stranded RNA virus with glycoprotein spikes on the outer surface [1,2,3]. Symptoms for covid-19 include fever, cough, shortness of breath, muscle ache, tiredness, sore throat, headache, chest pain, nausea, and vomiting [4]. A febrile with chills and respiratory issues were seen in starting phase of infected patients. Some of the patients have asymptomatic conditions [4]. Men develop more complications compared to women [5,6]. Complications due to SARS-CoV2 include multiple organ failure, sepsis, septic shock, cardiovascular complications, acute pericarditis, left ventricular dysfunction, acute myocardial injury, arrhythmias, heart failure, Massive pulmonary embolism, necrotising pneumonia, coagulopathy, venous thromboembolism, elevated D-dimer and prolonged prothrombin time, laryngitis and laryngeal edema. Hypertension, diabetes, cardiovascular complications, respiratory complications patients face severe effects due to COVID-19 infections [5-9]. Most of the comorbidities occur to men than women. Laboratory examination includes WBC, lymphocyte, C-reactive protein, D-dimer, whole blood counts. When the patients get positive primarily, there will be decreased WBC, lymphocyte, increased C-reactive protein, LDH, liver enzymes, D-dimer. These blood counts, lymphopenia, eosinopenia, and neutrophil/lymphocyte ratio are ≥ 3.13 means it indicates a severe scenario. Decreased blood

lymphocytes, imbalance alterations of multiorgan, and increased D-dimer results in critical patients [5,10]. The main focus of this study is to determine the impact or the effect of COVID-19 on the conditions such as hypertension and diabetes mellitus by comparing their laboratory investigations. The mechanism states that the entry for the SARS-CoV2 virus in Hypertensive patients is by ACE 2 inhibitors. This ACE 2 inhibitors can be present in many organ systems, which includes the cardiovascular system and respiratory system. The SARS-CoV2 enzyme catalyzes angiotensin II to angiotensin I, which is a peptide [11]. Hypertension may be a risk factor for COVID-19 patients with severity and mortality [9]. Diabetic patients are more prone to COVID-19. There was a bidirectional relationship between COVID-19 and Diabetes. Even obesity and Type 2 diabetes have a strong relationship which leads to severe infection. In diabetes, there is no exact mechanism of diabetes on COVID-19 till now, but it may lead to infection such as MERS & SARS in an in-vitro study conducted in animal models [12,13]. The common factors associated with the poor prognosis in COVID-19 include advanced age and pre-existing conditions such as diabetes and hypertension. This study helps in the assessment of the impact of COVID-19 on diabetic and hypertensive patients. There is minimal evidence on the clinical characteristics and outcome of hospitalized COVID-19 with or without diabetes mellitus and hypertension in the south-Indian population.

1.1 Aim and Objective

To assess the impact of COVID-19 on diabetic and hypertensive patients.

To evaluate the association between COVID-19 and its risk factors (diabetes and hypertension) and to evaluate whether the severity of the symptoms in COVID-19 patients is due to comorbidities or past medications.

2. MATERIALS AND METHODS

A Retrospective study was conducted in SRM Hospital (Medical Records Department) for a period of 3 Months with the study population 670 at the age group of 25, known case of Diabetes and Hypertension. Cases of Pregnant women are excluded from the study. The patients were grouped into 4 categories 1) control group (patient without any co-morbidities) 2) diabetic patients 3) Hypertensive patient 4) Diabetic+Hypertension patient and studied their prescribing pattern by collecting the past medication history.

2.1 Statistical Analysis

Statistical analysis was carried out using GRAPH PAD PRISM, unpaired t-test and MS-EXCEL. Data are expressed as mean \pm standard deviation and P-value

2.2 Procedure

Patient demographic information such as age, gender was collected between May 1 and July 28, 2020, at SRM hospital, kattankulathur and recorded. Patients previous medical history were also collected. Hematological parameters, such as Hb, neutrophil, lymphocytes, WBC, platelet were compiled, and the vital signs such as temperature, pulse rate, respiration rate, SPO2 were noted. All the patients included in this study have undergone an RT-PCR test with a test result of positive sign, and the D-DIMER test has been conducted in every individual patient. This study comprises of total 670 COVID-19 infected patients, of which 458 were male patients (68.35%), 212 female patients (31.64%).

From the collected data, the patients were categorized into four groups,

1. Control patients, only infected with SARS-CoV2 virus (480) (neither diabetic nor hypertensive)
2. Diabetic patients infected with the SARS-CoV2 virus (84)
3. Hypertensive patients infected with the SARS-CoV2 virus (44)

4. Both diabetic and hypertensive and also infected with SARS-CoV2 virus (62)

3. RESULTS AND DISCUSSION

3.1 Anti-Diabetic Drugs Prescribing Pattern in Study Population (Past Medication History)

Many studies stated the prior usage of antidiabetic and antihypertensive drugs might worsen or be associated with COVID-19. In that view, we were also involved in collecting the medication details of the diabetic and hypertensive patients. In the diabetic group of patients, we classified the drugs according to their various anti-diabetic drug classes, such as sulfonylureas, Biguanide, DPP4, α glucosidase inhibitor, SGLT-2, Insulin and combination including sulfonylureas + Biguanide, DPP4 + Biguanide.

Out of 146 diabetic patients, we found that 44 patients were using sulfonylureas, 62 were found to use Biguanide, 10 patients were found to use DPP4, 12 patients have found to use α glucosidase inhibitor, 8 people use sulfonylureas + Biguanide, 2 of the patient use DPP4 + Biguanide, 6 patients use SGLT-2, 24 patients use Insulin. 16 patient follows traditional treatment such as Ayurveda, Siddha, and homeopathy.

This includes the patient who uses both Anti-hypertensive and Anti-diabetic drugs (DM+HTN patient).

3.2 Antihypertensive Drugs Prescribing Pattern in Study Population

In the case of the hypertensive patient, we classified the medications into their respective antihypertensive classes such as β blocker, calcium channel blocker, Angiotensin II Receptor Blocker (ARB), α adrenergic blocker, α + β blocker, Angiotensin-Converting Enzyme Inhibitor (ACE Inhibitor).

Out of 106 hypertensive patients, 14 patients use β blocker, 32 patients use calcium channel blocker, 40 patients use ARB, 4 patients use α adrenergic blocker, 2 patients use α + β blocker, 2 people use ACE Inhibitor, 16 people are not at the regular use of medication or discontinued the treatment.

COVID-19 patient has been found with or without symptoms. We classified them into symptomatic and asymptomatic groups.

1. In the control group of patients, 288 presented with symptoms, and 192 were without symptoms or asymptomatic.
2. In a diabetic group of patients, 78 presented with symptoms and 6 were without symptoms.

3. In the hypertensive group of patients, 40 presented with the symptom, and 4 were without the symptom.
4. In diabetes + hypertension group of patients, 54 presented with the symptom, and 8 were without symptoms.

This data classification shows that people involved in this study were majorly found to be symptomatic (68.7%), whereas asymptomatic is 31.3%.

i) Vitals of Control Patient Vs Diabetic Patient:

Table 1. Vitals of control patient vs diabetic patient

PARAMETER	CONTROL		DIABETES		P-VALUE
	MEAN	± SD	MEAN	± SD	
TEMPERATURE °f	98.403	0.756	98.1571	1.251563	0.0001
PULSE RATE beats/min	82.107	8.525	82.7619	7.71065	0.667
RESPIRATION RATE Breaths/min	22.068	1.873	21.5714	1.952395	0.153
SPO2 %	97.264	2.024	96.8571	2.32244	0.2949
SYSTOLIC BP mmHg	116.98	7.894	122.381	10.07521	0.0001
DIASTOLIC BP mmHg	76.176	5.977	77.1429	7.419721	0.4124
HB mg/mL	13.286	2.097	13.1143	2.167788	0.6590
NEUTROPHILS mm ³	68.222	11.575	68.4929	14.77972	0.4135
LYMPHOCYTES 10 ³ cells/μL	25.716	13.964	25.0712	10.07927	0.7863
PLATELETS mcl	240869	92048.1	231262	72073.65	0.5468
WBC Mm ³	8197.8	7300.35	7744.98	6144.142	0.7242
ESR mm/hr	30.245	26.308	20.6476	16.17707	0.0297
ALBUMIN g/L	3.9186	0.692	3.8333	0.61237	0.6868
D-DIMER ng/mL	247.11	80.676	314.976	210.734	0.0058

3.3 Comparing the Vitals of Control Patient Vs Diabetic Patient Reveals

1. Control patients has significantly higher temperature than Diabetic patients (P-value = 0.001).
2. Diabetic patients have significantly higher systolic pressure than the control patients (P-value = 0.0001).
3. Control patients have significantly higher ESR level than the diabetic patients (P-value = 0.0297).
4. Diabetic patients have a significantly higher D-Dimer value than the control patients (P-value = 0.0058).

ii) Vitals of Control Patients Vs Hypertensive Patients:

Table 2. Vitals of control patients vs hypertensive patients

PARAMETER	CONTROL		HYPERTENSION		P-VALUE
	MEAN	± SD	MEAN	± SD	
TEMPERATURE °f	98.403	0.756	98.2435	0.561513	0.0001
PULSE RATE beats/min	82.107	8.525	84.1739	10.81519	0.3210
RESPIRATION RATE Breaths/min	22.068	1.873	21.913	2.130152	0.725
SPO2 %	97.264	2.024	97.7391	0.751809	0.2717
SYSTOLIC BP mmHg	116.98	7.894	139.13	13.45465	0.0001
DIASTOLIC BP mmHg	76.176	5.977	90.4348	5.623216	0.0001
HB mg/mL	13.286	2.097	13.4696	1.417563	0.6913
NEUTROPHILS mm ³	68.222	11.575	68.4783	9.556956	0.0001
LYMPHOCYTES 10 ³ cells/μL	25.716	13.964	23.413	8.749821	0.4505
PLATELETS mcL	240869	92048.15	234291	59445.43	0.7441
WBC Mm ³	8197.82	7300.355	6640	2045.076	0.3137
ESR mm/hr	30.2451	26.308	17	9.885711	0.0193
ALBUMIN g/L	3.91863	0.692	3.84348	0.602892	0.6032
D-DIMER ng/mL	247.118	80.676	299.783	210.8761	0.0501

3.4 Comparing the Vitals of Control Patient Vs Hypertensive Patient Reveals

1. The Control patients had a significantly higher Temperature than the Hypertensive patients (P-value = 0.0001)
2. The Systolic and Diastolic pressure is significantly higher in Hypertensive patients than in the Control (P-value =

- 0.0001).
3. The Neutrophil count is significantly higher in Hypertensive patients than in the Control (P-value = 0.0001)
4. The ESR level is significantly higher in Control than the Hypertensive patients (P-value = 0.0193)
5. D-dimer value is significantly higher in Hypertensive patients than the Control (P-value = 0.0501)

iii) Control Patient Vs Diabetic+Hypertensive Patient:

Table 3. Control patient vs diabetic+hypertensive patient

PARAMETER	CONTROL		DIABETIC+HYPERTENSION		P-VALUE
	MEAN	± SD	MEAN	± SD	
TEMPERATURE °f	98.4039	0.756218	97.771	2.715166	0.2172
PULSE RATE beats/min	82.1078	8.525915	86.0968	15.73606	0.069
RESPIRATION RATE Breaths/min	22.0686	1.873525	23.9032	10.79616	0.1012
SPO2 %	97.2647	2.024242	96.1613	4.188053	0.0467
SYSTOLIC BP mmHg	116.98	7.894076	122.903	15.74665	0.0013
DIASTOLIC BP mmHg	76.1765	5.977535	73.5806	15.68816	0.1705
HB mg/mL	13.2863	2.09795	12.9065	7.79692	0.6659
NEUTROPHILS mm ³	68.2225	11.57593	74.7387	14.05958	0.4128
LYMPHOCYTES 10 ³ cells/μL	25.7167	13.96406	20.2677	11.22258	0.0493
PLATELETS mcl	240869	92048.15	240180.6 452	74967.05	0.9698
WBC Mm ³	8197.82	7300.355	8888.16	5612.865	0.6290
ESR mm/hr	30.2451	26.30832	66.8065	32.42059	0.0001
ALBUMIN g/L	3.91863	0.6929589	3.74194	0.704166	0.1515
D-DIMER ng/mL	247.118	80.67675	339.387	511.403	0.0798

3.5 Comparing the Control Patient Vs Diabetes + Hypertension Patient Reveals

The SPO2 is significantly higher in control patient than the Diabetic + Hypertensive patients (P-value = 0.0467). Diabetic + Hypertensive patients has significantly higher systolic pressure than the control (P-value = 0.0013). The control patients had significantly higher lymphocyte count than Diabetic+ Hypertensive patients (P-value = 0.0493). Diabetic + Hypertensive patients has significantly higher ESR level than the control (P-value = 0.0001).

iv) Comparing Diabetic Male Vs Female Patient:

Female patient had significantly higher neutrophil than the male patient (P-value = 0.0361).

v) Comparing Hypertensive Male Vs Female Patient:

The male patient had a significantly higher neutrophil count than the female patient (P-value= 0.0257) The male patient had a significantly higher D-Dimer value than the female patient (P-value= 0.0517).

vi) Comparing Diabetic + Hypertensive Male Patients Vs Female Patient:

The male patient had a significantly higher neutrophil count than the female patient (P-value= 0.0319). The male patient had significantly higher D-dimer than the female patient (P-value = 0.0001).

vii) Analysing among the Male Patient of Control and Diabetes:

Control male patient has significantly higher respiration rate than the diabetic male

patient (P-value = 0.0073). A diabetic male patient has a significantly higher d-dimer value than the control male patient P-value = 0.0006).

viii) Analysing among the Female Patient of Control and Diabetes:

The diabetic female patient has significantly higher systolic pressure than the control female patient P-value = 0.0124. The diabetic female patient has a significantly higher D-Dimer value than the control female patient P-value = 0.0194.

ix) Analysing among the Male Patient of Control and Diabetes + Hypertension:

The hypertensive male patient has significantly higher systolic and diastolic pressure than the Control male patients p-value = 0.0001. The hypertensive male patient has significantly higher neutrophils than the Control male patients P-value = 0.0225. Control male patients have significantly higher ESR count than the hypertensive male patient p-value = 0.0465. Hypertensive male patients have significantly higher D-dimer value than the Control male patient P-value = 0.0001.

x) Analysing among Female Patients of Control and Hypertension:

The hypertensive female patient has significantly higher systolic and diastolic pressure than the control female patient p-value = 0.0001. The hypertensive female patient has a significantly higher D-dimer value than the control female patient P-value = 0.0057.

xi) Analysing among the Male Patients of Control and Diabetes + Hypertension: Exhibits

Diabetic + hypertensive male patient has significantly higher pulse rate than the Control male patient p-value = 0.0198. Control male patient has significantly higher HB level than the Diabetes + hypertension male patient p value= 0.0106. Diabetic + hypertensive male patient has significantly higher neutrophil count than the Control male patient p-value = 0.0001. Diabetic + hypertensive male patient has significantly higher D-Dimer value than the Control male patient P-value = 0.0001.

xii) Analysing among Female Patient of Control And Diabetic + Hypertensive: Shows

Diabetic + hypertensive female patient has significantly higher ESR level than the control female patient P-value = 0.0001.

The COVID-19 infection, which became pandemic worldwide, is caused by (SARS CoV2) Severe Acute Respiratory Syndrome Coronavirus. Type 2 Diabetes mellitus and hypertension commonly occur in many COVID-19 infected patients. Type 2 diabetes mellitus is shown as significant comorbidity in COVID-19 patients. Many studies found that 50% of the patients affected with covid-19 infection have Type 2 Diabetes mellitus. The China data found that the patients with Type 2 Diabetes mellitus diagnosed with COVID-19 have an eightfold higher mortality rate than non-type two diabetes mellitus patients. Many studies have shown that patients with Type 2 diabetes mellitus and hypertension diagnosed with COVID-19 infection have more severity and mortality [14-18]. Though Type 2 diabetes mellitus and hypertension majorly combine, their role independently has not been defined yet. Gao and colleagues found after comparing non-hypertensive on COVID-19 patients with hypertensive on COVID-19 patients, and the hypertensive COVID-19 patients showed a significant increase in the risk of mortality. Hypertension itself is an independent risk factor for worse clinical outcomes [19]. Advanced age, male, sex, history of cardiovascular diseases, chronic kidney disease and tumour also contribute as risk factors. A meta-analysis study with 3994 COVID-19 patients from China showed hypertension, Type 2 diabetes mellitus, history of cardiovascular disease, COPD, CKD has associated with serious outcomes like ICU admission and artificial ventilation. But only Type 2 diabetes mellitus had a significant impact on death. Another recent study and meta- analysis identified Type 2 diabetes mellitus as a risk factor for death. Another report has shown that among COVID-19 patients, 40% of patients had chronic diseases, in which Type 2 diabetes mellitus contribute to 17% [20-26]. The same report has shown that COVID-19 patients with Type 2 diabetes mellitus have higher mortality when compared to non-Type 2 diabetes mellitus patients. The COVID-19 Type 2 diabetes mellitus patients have unique manifestations and notable laboratory findings compared with non-comorbid patients [27]. This identification and distinguishing between COVID-19 patients

without comorbidities and COVID-19 patients with comorbidities may improve diagnosis and proper treatment. Our study compared different laboratory parameters and other parameters between COVID-19 patients with Type 2 diabetes mellitus and hypertensive patients with control populations. Hypertension is one of the most commonly occurring comorbidities in COVID-19 patients. But the role of hypertension on mortality of COVID-19 patients is not known. A randomized trial also showed an immune response against a pathogen increases aortic stiffness, which is a significant determinant of systolic blood pressure [28,29]. The retrospective study conducted by Jacques Amar MD et al. showed WBC, neutrophil, D-dimer was increased in hypertensive COVID-19 patients compared to non-hypertensive patients. In contrast, there is a significant decrease in a lymphocyte in COVID-19 Type 2 diabetic patients in our study. These results suggest that different mechanism exists for hypertension and diabetes mellitus as risk factors for COVID-19. It is also known that these patients have impaired immune response to many infections [30]. In our retrospective study, we collected 670 COVID-19 cases. It consists of 12.5% of diabetic patients and 6.6% of hypertensive patients. We compared COVID-19 patients without any comorbidity (neither Type 2 diabetes mellitus nor hypertension) with COVID-19 patients with comorbidities (Type 2 diabetes mellitus and hypertension). COVID-19 patients with T2DM have an increased level of D-dimer compared to non-T2DM patients. It is similar to the results of an observational study conducted by Yogendra Mishra et al., which also shows an increase of D-dimer in COVID-19 T2DM patients when compared to non-diabetic patients [31]. In comparing hypertensive COVID-19 patients with non-comorbid covid-19 patients, neutrophil count and D-dimer levels are significantly higher in hypertensive covid-19 patients. The retrospective study conducted by Jacques Amar MD et al. shows a similar result of neutrophil and D-dimer increase in hypertensive COVID-19 patients than non-comorbid patients. We also compared male covid-19 diabetic patients with female covid-19 diabetic patients. The female patient had significantly abnormal higher neutrophil than the male. Compared with male and female COVID-19 patients with hypertension, the male patient had significantly abnormal more elevated neutrophil and D-dimer than male patients. We compared only male patients of hypertensive COVID-19 patients with non-comorbid patients who showed hypertensive COVID-19 patients with substantially higher ESR and D-dimer

values than non-comorbid patients. There is a controversy that RAS blockers increase the expression of ACE-2 as SARS-COV2 infect cells by binding to the sites of ACE-2 receptors. In this perspective, we also collected a report of drugs consumed by diabetic and hypertensive COVID-19 patients. Diabetic covid-19 patients are majorly consuming 30% of Sulfonylureas and 42.5% of Biguanides. Biguanides and sulfonylureas have protective action of lung injury induced by COVID-19. Metformin inhibits mitochondrial complex I, which therefore reduce lung damage and oxidative stress. Metformin should stop it in critically ill patients and hospitalised as it has a risk of lactic acidosis. Sulfonylureas inhibit the nucleotide-binding oligomerisation domain (NOD) like receptor family and alleviate acute lung injury. But it is not encouraged in inpatients because of the risk of Hypoglycemia. Insulin therapy is more encouraged, and it is beneficial in alleviating lung injury [32]. The significant drugs consumed by hypertensive covid-19 patients are 30% of calcium channel blockers and 37.7% of ARBs (Angiotensin receptor blockers). A meta-analysis study conducted by Luren et al. on incidence, severity, hospitalisation, ICU admission and mortality of COVID-19 patients with prior usage of ARBs doesn't have any association with COVID-19 infected patients. It is safe to continue the medication, and the association is only with the disease and not the drugs. Another cohort study conducted by Jaiyong Kim et al. published in 2020 demonstrates that ACEIs and ARBs or any other antihypertensives do not increase covid-19 infection [36], and patients with good adherence to calcium channel blockers showed the minimal risk to COVID-19 disease.

4. CONCLUSION

In summary, Diabetic and hypertensive patients affected with COVID-19 are low in our study. Out of 670 COVID-19 patients, only 12.5% are diabetic, 6.56% are hypertensive, and 9.25% were both diabetic and hypertensive. But when comparing in terms of severity, hypertensive and diabetic patients have severe effects than the control patients. In simpler terms, not every person who has diabetes and hypertension are affected with COVID-19, but those who were affected by COVID-19 showed more severity than the patients who don't have any comorbidities (Diabetes and hypertension).

In gender-wise, the study population has more male patients (458) than female patients (212).

On comparing the laboratory investigation, it is seen that male patients showed more or high severity than female patients.

Furthermore, studies have to be done to investigate whether hypertensive and diabetic patients' severity are due to condition (Diabetic and Hypertension) or due to the medication used.

5. LIMITATIONS

Interpretation of the findings is limited by sample size. Its retrospective nature limits this study. Despite these limitations, this study identifies many different lab abnormalities on the COVID-19 patient with Type 2 Diabetes mellitus and Hypertension, which might be helpful for future findings.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

STUDY SIGNIFICANCE

The study highlights the efficacy of " Ayurveda, Siddha " which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

CONSENT AND ETHICAL APPROVAL

As per international standard or university standard guideline Patient's consent and ethical approval has been collected and preserved by the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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