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To study the burden of anemia in non-communicable diseases in a tertiary care Centre in Kumaon region of Uttarakhand

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Abstract

Introduction: Non-communicable diseases (NCDs) encompass a vast group of diseases such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases. These behavioural and biological risk factors, with a predisposition to the development of NCDs, are use of tobacco and alcohol, physical inactivity, overweight and obesity, increased fat and sodium intake, low fruit and vegetable intake, raised blood pressure (BP), blood glucose and cholesterol levels. **Aim:** To study the burden of anemia in non-communicable diseases in a tertiary care centre in Kumaon region of Uttarakhand.**Materials and method:** This is an cross sectional observational study was conducted in the Department of Medicine, Dr.SusheelaTiwari Memorial Government Hospital, Haldwani, from January 2019 to September 2020. Patients of Non communicable diseases (Type-2DM, HTN, CAD) were selected based on inclusion and Exclusion criteria after obtaining written informed consent.**Results:** In present study, prevalence of anemia was 82 (32.8%). Overall prevalence of anemia was significantly higher in Type 2 DM, hypertensive, and CAD patients as compared to those who did not had Type 2 DM. In similar way higher in patients who have more than 10 years history of diabetes, hypertension and CAD, raised HbA1c(>7.5), SBP ≥ 140, and DBP ≥ 90. Hb and HBA1C lab parameters were statistically significant. **Conclusion:** The duration of NCDs was directly proportional to the burden of anemia. The burden of anemia was higher in subsets of patients having CAD. The burden of anemia was higher in patients having poor control of diabetes mellitus and blood pressure.
Keywords: Non-communicable diseases, anemia.

Introduction

Non-communicable diseases (NCDs) encompass a vast group of diseases such as cardiovascular diseases, cancer, diabetes and chronic respiratory diseases. NCDs contribute to around 38 million (68%) of all the deaths globally and to about 5.87 million (60%) of all deaths in India.Behavioural and biological risk factors, with a predisposition to the development of NCDs, are use of tobacco and alcohol, physical inactivity, overweight and obesity, increased fat and sodium intake, low fruit and vegetable intake, raised blood pressure (BP), blood glucose and cholesterol levels[1] increase predisposition to the development of NCDs, coexistent correctable condition like anemia further increases morbidity and mortality in these subjects.India being a populous country of about 1.3 billion, contributes to more than 2/3rd of the total deaths due to NCDs in the South-East Asia Region (SEAR) of WHO[2].Anemia, as defined by World Health Organization (WHO) criteria less than 130 g/L for men and less than 120 g/L for women, is a common blood disorder and it is a condition in which the number of red blood cells (RBCs) is inadequate to meet the physiologic needs of the human body [3,4]. Adverse effects of long standing anemia are various and affects multiple system and organ of body at changes, physical response to diseases, physiological stressed condition like our pregnancies. Iron, vitamin B12 and folate deficiencies are the common causes of anemia. Poor diet, lack of sense of hygiene which

lead to worm infestations, lack of health consciousness social taboos and poor economic status all contributes to overwhelming prevalence of anemia.Anemia being a common condition in india contributes significantly to the morbidity especially when it, is associated with different NCDs, anemia being a treatable condition if identified and treated adequately will improve quality of life of many patients with NCDs. In this background our objective was to find out the burden of anemia in non communicable diseases.

Materials and methods

This is an cross sectional observational study was conducted in the Department of Medicine, Dr.SusheelaTiwari Memorial Government Hospital, Haldwani, from January 2019 to September 2020. Subjects were selected from patients presenting to the Medicine Department based on inclusion and Exclusion criteria after obtaining written informed consent.Patients of Non communicable diseases (Type-2DM, HTN, CAD) were selected and these patients were categorised as anaemic on the basis of WHO Criteria: Males Hb<13gm% and Females Hb<12gm%.Two hundred and fifty patients who were diagnosed with Type 2DM, Hypertension, and CAD were included. The research procedure followed was in accordance with approved ethical standards of Government Medical College, Haldwani, Ethics Committee.Patients with age >30 years, all cases of Type 2 DM, HTN, CAD hospitalised during the study period and patients ready to give informed consent were included in the study. While pregnant women of all ages, patients with acute blood loss and patient on steroids therapy, Anticoagulants, Thrombolytic Therapy, chronic kidney disease, Chronic liver disease, Chronic alcoholic liver disease and bleeding disorder, Acute coronary syndrome, Malignancy and Haematological disorders and Infections and patient with history of recent major surgery were excluded from the study. A written

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consent was taken from all potentially eligible subjects and subjects were excluded from the study if they were not matched with inclusion criteria of the study.A structured questionnaire was used to collect information from each patient. The information obtained included demoFigic data, age, occupation, marital status, educational level, Relevant history of duration and of onset of NCD was taken. Detailed history of family, smoking, alcohol habit was recorded. Every patient who declared himself /herself a smoker and alcoholic at the movement of evaluation was considered as smoker and alcoholic regardless of the amount of cigarettes and alcohol consumed.BMI was calculated by standard formulae as weight divided by square of height (kg/metre square) and Patients were categorised as overweight and obese based on WHO criteria[5]. Blood pressure was taken using a manual sphygmomanometer in right arm sitting position in single setting.Hypertension was defined as a self-reported presence of hypertension/use of antihypertensive medications.Anemia was categorised on the basis of morphological classification:Microcytic: (MCV<80fll), Normocytic: (MCV80 – 100), Macrocytic: (MCV>100)[6].Patients were also evaluated for type of anemia by GBP and RBC indices were above taken. The patients were subjected to lab and imaging investigations results like Serum creatinine, Hb, GBP, MCHC, MCV, Reticulocyte count, ECG.Proforma was prepared in English and Hindi to make it convenient for the population to communicate.

Results

This study was conducted in the Department of Medicine, Government Medical College, Dr.SusheelaTiwari Hospital Haldwani Nainital, Uttarakhand from January 2019 to September 2020, where a total of 250 patients of Type2DM, hypertension, CAD were included.In present study, we studied the burden of anemia in non-communicable diseases.A total of 250 patients were included in the study, majority of the patients were female–157(62.8%) and males were 93(37.2%). Mean age of the study patients was 52.3±14.5 years. Anemia was reported in 82 patients(32.8%).Mean age of the anemic patients was significantly higher as compared to non-anemic patients. Increasing age was associated with higher prevalence of the anemia.Overall prevalence of anemia was significantly higher in Type 2 DM patients as compared to those who did not had Type 2 DM (Presence of DM vs. Absence of DM: 53.6% vs. 30.2%, p – value = 0.013). Prevalence of anemia was significantly higher in male diabetic patients as compared to male patients who did not had Type2DM (Presence of DM vs. Absence of DM: 53.8% vs. 22.5%; p – value = 0.018) whereas prevalence of anemia was not significantly different in female diabetic patients as compared female patients who did not had Type2DM(Presence of DM vs. Absence of DM:53.3%vs. 34.5%; p–value=0.149) (table 1, Fig 1)

Table 1: Distribution of Anemia in different NCD,s (DM, HTN & CAD)

| Clinical History	Total (n=250)		Male (n=93)		Female (n=157)	
	n (%)	Anemic	n (%)	Anemic	n (%)	Anemic
Type2DM						
Yes	28 (11.2%)	15/28 (53.6%)	13 (14%)	7/13(53.8%)	15(9.6%)	8/15(53.3%)
No	222(88.8%)	67/222 (30.2%)	80 (86%)	18/80(22.5%)	142(90.4%)	49/142(34.5%)
Chi Square Value	6.172		5.590		2.079	
p-value	0.013*		0.018*		0.149	
HTN						
Yes	121(48.4%)	50/121 (41.3%)	47(50.5%)	18/47(38.3%)	74(47.1%)	32/74(43.2%)
No	129(51.6%)	32/129 (24.8%)	46(49.5%)	7/46(15.2%)	83(52.9%)	25/83(30.1%)
Chi Square Value	7.049		3.745		3.348	
p-value	0.008*		0.053		0.067	
CAD						
Yes	26 (10.4%)	15/26 (57.7%)	14(15.1%)	8/14(57.1%)	12(7.6%)	7/12(58.3%)
No	224(89.6%)	67/224 (29.9%)	79(84.9%)	17/79 (21.5%)	145(92.4%)	50/145 (34.5%)
Chi Square Value	7.727		6.301		2.913	
p-value	0.005*		0.012*		0.088	

*p-value < 0.05, statistically significant
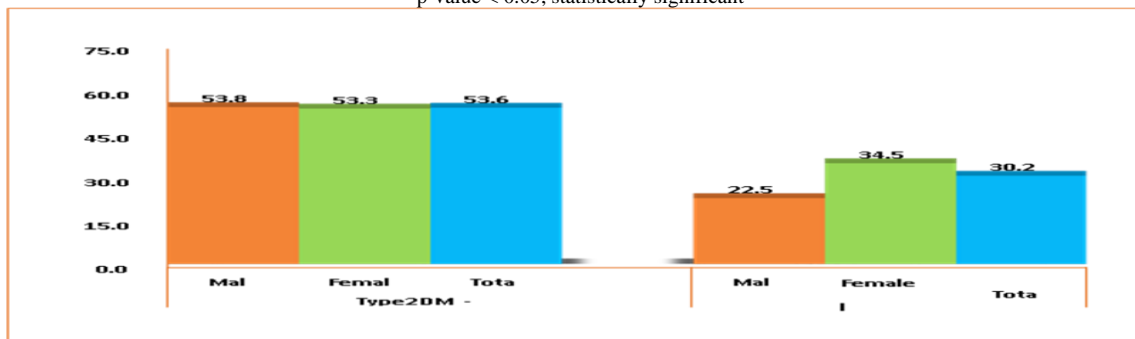
Fig 1: Distribution of NCD's (DM) and Anemia

Overall prevalence of anemia was significantly higher in hypertensive patients as compared to those who did not had HTN (Presence of HTN vs. Absence of HTN: 41.3% vs. 24.8%, p – value = 0.008). Prevalence of anemia was not significantly different in male and female patients who had HTN as compared to those patients who did not had HTN (p – value > 0.05). However prevalence of anemia was higher in male and female patients who had HTN. (table 1, fig 2)
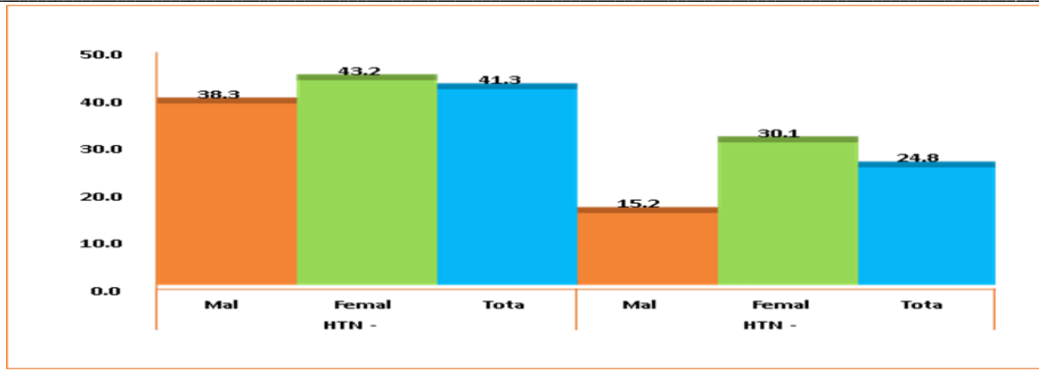
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Fig 2: Distribution of NCD's (HTN) and Anemia

Overall prevalence of anemia was significantly higher in CAD patients as compared to those who did not had CAD (Presence of CAD vs. Absence of CAD: 57.7% vs. 29.9%, p – value = 0.005). Prevalence of anemia was significantly higher in male CAD patients as compared to male patients who did not had CAD (Presence of CAD vs. Absence of CAD: 57.1% vs. 21.5%; p – value = 0.012) whereas prevalence of anemia was not significantly different in female CAD patients as compared to female patients who did not had CAD (Presence of CAD vs. Absence of CAD: 58.3% vs. 34.5%; p – value = 0.088). (table 1, fig 3)
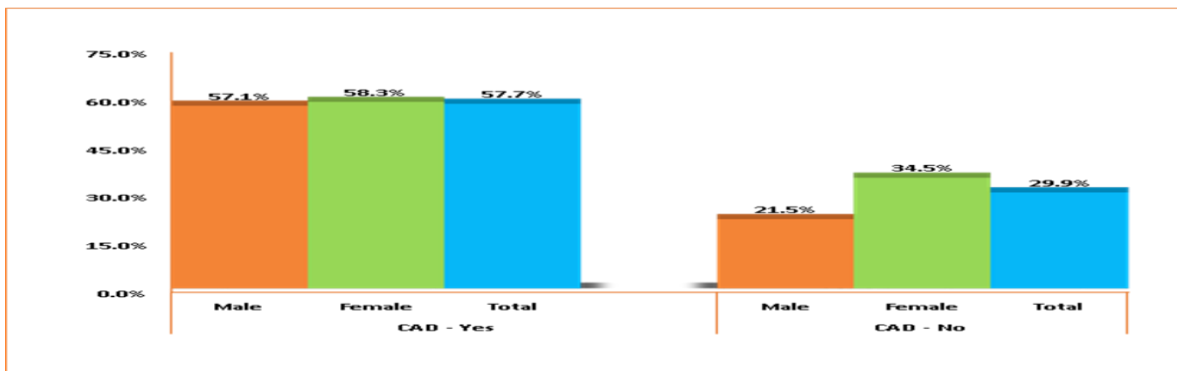

Fig 3: Distribution of NCD's (CAD) and Anemia

Overall prevalence of anemia was significantly higher in diabetic patients who had history of more than 10 years as compared to those diabetic patients who had history of less than 10 years (> 10 vs.< 10 years : 72.2% vs. 20.0%, p – value = 0.002).Prevalence of anemia was significantly higher in male diabetic patients who had history of more than 10 years as compared to those male diabetic patients who had history of less than 10 years (Male DM > 10 years vs. Male DM < 10 years : 75.0% vs. 20.0%; p – value = 0.001) prevalence of anemia was higher in female diabetic patients who had history of more than 10 years as compared to those female diabetic patients who had history of less than 10 years (table 2. Fig 4)

Table 2: Distribution of duration of NCD's and Anemia

Clinical History	Total		Male		Female	
	n (%)	Anemic	n (%)	Anemic	n (%)	Anemic
Type2DM (n=28)						
≤ 10 Years	10 (35.7%)	2/10 (20%)	5 (38.5%)	1/5 (20%)	5(33.3%)	1/5 (20%)
> 10 Years	18 (64.3%)	13/18 (72.2%)	8 (61.5%)	6/8 (75%)	10(66.7%)	7/10 (70%)
Chi Square Value	9.775		10.505		2.093	
p-value	0.002*		0.001*		0.148	
HTN (n=121)						
≤ 10 Years	71 (58.7%)	21/71 (29.6%)	27(57.4%)	5/27 (18.5%)	44(59.5%)	16/44(36.4%)
> 10 Years	50 (41.3%)	29/50 (58.0%)	20(42.6%)	13/20 (65%)	30(40.5%)	16/30 (53.3%)
Chi SquareValue	8.157		7.678		2.726	
p-value	0.004*		0.006*		0.039*	
CAD (n=26)						
≤ 10 Years	10 (38.5%)	4/10 (40%)	5 (35.7%)	2/5 (40%)	5(41.7%)	2/5 (40%)
> 10 Years	16 (61.5%)	11/16 (68.8%)	9 (64.3%)	6/9 (66.7%)	7(58.3%)	5/7 (71.4%)
Chi Square Value	2.084		0.933		1.185	
p-value	0.149		0.334		0.276	

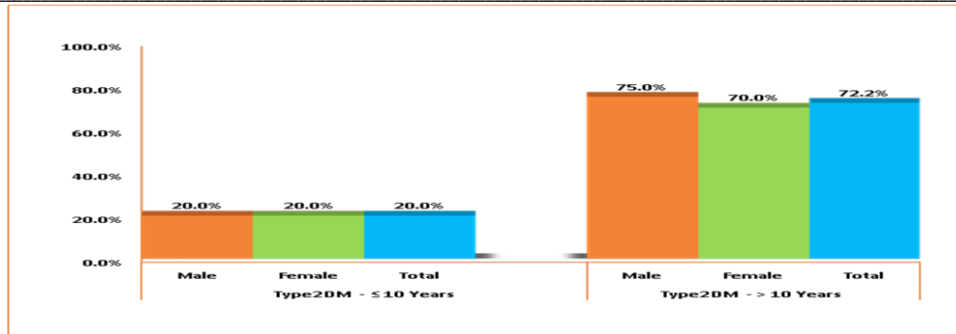*p-value < 0.05, statistically significant

Fig 4: Distribution of duration of NCD's (Type 2 DM) and Anemia

Overall prevalence of anemia was significantly higher in hypertensive patients who had history of more than10 years as compared to those hypertensive patients who had history of less than10 years(> 10 vs. < 10 years : 58.0% vs. 40.0%, p – value = 0.004). Prevalence of anemia was significantly higher in male hypertensive patients who had history of more than 10 years as compared to those male hypertensive patients who had history of less than 10 years (Male HTN > 10 years vs. Male HTN < 10 years : 65.0.0% vs. 18.5%; p – value = 0.006) as well as prevalence of anemia was significantly different in female hypertensive patients who had history of more than 10years as compared to those female hypertensive patients who had history of less than 10 years (Female HTN > 10 years vs. Female HTN < 10 years : 53.3% vs. 36.4%; p – value = 0.039). (Table 2 Fig 5)
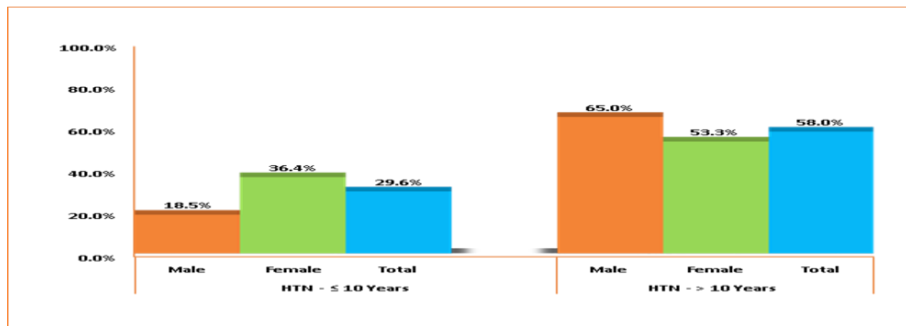

Fig 5: Distribution of duration of NCD's (HTN) and Anemia

Prevalence of anemia was significant higher in diabetic patients who had raised HbA1c(>7.5) as compared to diabetic patients who had HbA1c(<_7.5).(Table 3)

Table 3: Distribution of Anemia in Controlled and uncontrolled Type2DM patients

HbA1c	Total (n=28)		Male (n=13)		Female (n=15)	
	n (%)	Anemic	n (%)	Anemic	n (%)	Anemic
Controlled (≤ 7.5)	13 (46.4%)	3/13 (23.1%)	5 (38.5%)	1/5 (20.0%)	8(53.3%)	2/8 (25.0%)
Uncontrolled (> 7.5)	15 (53.6%)	12/15 (80.0%)	8 (61.5%)	6/8 (75.0%)	7(46.7%)	6/7 (85.7%)
Chi Square Value	9.073		3.745		5.529	
p-value	0.003*		0.043*		0.019*	

*p-value < 0.05, statistically significant

Overall prevalence of anemia was significantly higher in patients who had SBP ≥ 140 as compared to those patients who had SBP<140(SBP:≥140VS.<140–44.7%   vs.25.6%,p–value=0.002). Prevalence of anemia was significantly higher in male patients who had SBP ≥ 140 as compared to those male patients who had SBP<140(MaleSBP≥140vs.MaleSBP<140:39.5%vs.18.2%;p–value= 0.023) as well as prevalence of anemia was significantly higher in female patients who had SBP≥140 as compared to those female patients who had SBP <140(Female SBP≥140vs. Female SBP<140: 48.2% vs. 29.7%; p – value = 0.021). (table 4)

Table 4: Distribution of Blood Pressure Profile of study population in Anemia

Blood Pressure Profile	Total(n=250)		Male(n=93)		Female(n=157)	
	n (%)	Anemic	n (%)	Anemic	n (%)	Anemic
SBP						
< 140	156 (62.4%)	40/156 (25.6%)	55(59.1%)	10/55(18.2%)	101(64.3%)	30/101(29.7%)
≥ 140	94 (37.6%)	42/94 (44.7%)	38(40.9%)	15/38(39.5%)	56(35.7%)	27/56(48.2%)
Chi Square Value	9.647		5.183		5.338	
p-value	0.002*		0.023*		0.021*	
DBP						

< 90	134 (53.6%)	32/134 (23.9%)	43(46.2%)	6/43 (14%)	91 (58%)	26/91(28.6%)
≥ 90	116 (46.4%)	50/116 (43.1%)	50(53.8%)	19/50 (38%)	66 (42%)	31/66 (47%)
Chi SquareValue	10.424		6.801		5.600	
p-value	0.001*		0.009*		0.018*	

*p-value < 0.05, statistically significant

Overall prevalence of anemia was significantly higher in patients who had DBP ≥ 90 as compared to those patients who had DBP < 90 (DBP: ≥ 90 VS. < 90 – 43.1% vs. 23.9%, p – value = 0.001). Prevalence of anemia was significantly higher in male patients who had DBP ≥ 90 as compared to those male patients who had DBP < 90 (Male DBP ≥ 90 vs. Male DBP < 90: 38.0% vs. 14.0%; p –value= 0.009) as well as prevalence of anemia was significantly higher in female patients who had DBP≥90 as compared to those female patients who had DBP<90 (FemaleDBP≥90vs.FemaleDBP<90:47.0 vs. 28.6%; p – value = 0.018) (table 4). Hb and HBA1C lab parameters were statistically significant (Table 5). Majority of the patients - 56 (22.4%) were taken ACEi followed by aspirin – 30 (12.0%), metformin- 16 (6.4%), insulin – 8 (3.2%) and other OHA – 4 (1.6%).

Discussion

Considering high prevalence of anemia in general population and direct impact on the patient health, anemia causes important physiologic effect on the cardiovascular system and may further leads to suffering of the patients. Our aim was to study the burden of anemia in non communicable diseases.In our study, anemia was detected in 82 patients which was 32.8% of study population. In the study by Salma M.AlDallal et al[7].,in 2018, Among these 19,059 patients, 5,655 patients were found to be anemic accounting for 29.7% prevalence of anemia in this population. According to Mitku MammoTaderegew et al[6]., in 2020, The overall prevalence of anemia in the study participants was found to be 20.1%. In our study Mean age of the anemic patients was significantly higher as compared to non-anemic patients. These observations were consistent with the findings of ShivaniJatin Gandhi et al[8]., in 2017 increasing age associated with increased prevalence of anemia and greater percentage of females in anemic group(79.6%) as compared to non anemic group(55%).According to JackM.Guralik et al[9] in 2004 the prevalence of anemia in the population of 65 years of age and older is 10.6% and prevalence of anemia increased with each succeeding age group. In our study Overall prevalence of anemia was significantly higher in patients with Type2DM, hypertension and CAD as compared to those who did not have these. These observations were supported by previous studies done in past Krishnavenikandasamy et al[10].,in 2017. According to ShivaniJatin Gandhi et al[8] in 2017, found that patients with anemia had a greater average number of co-morbidities as compared to patient without anemia. Thambiah et al[11] anemia in type2DM was significantly associated with CKD. According to S.A Winther et al[12]anemia is a risk factor for cardiovascular disease and in heart failure patient anemia is indenpendent prognostic factor for death[13].In our study the overall prevalence of anemia was significantly higher in diabetic and hypertensive patients who had history of more than 10 years as compared to those patients who had history of less than 10 years. The above observations were similar to findings of Gunvanti B. Rathod et al[14]., in 2016, in their study they found that 64.4% of males and 50.6% of females had the disease for more than 5 years. In their study out of the 36 patients of anemia with diabetes mellitus, 21 (58.33%) patients had diabetes mellitus for more than 5 years duration.Prevalence of anemia was significantly higher in diabetic patients who had raised HbA1c(>7.5) as compared to diabetic patients who had HbA1c(<_7.5).15 patients had rasied HbA1c (>7.5), among them male patients were8 (61.5%) out of 8 patients, 6 patients had anemia whereas female patients, were 7 (46.7%) out of 7

patients, 6 patients had anemia.In the study by Salma M. AlDallal et al[7]., in 2018, 19,059 patients, 13,038 had their diabetes under control, whereas 6,021 patients were poorly controlled diabetics; 27.9% patients of the well controlled diabetic group had anemia, whereas 33.46% patients of poorly controlled diabetic group had anemia.The prevalence of anemia was significantly higher in patients who had SBP ≥ 140 as compared to the patients who had SBP<140 (SBP:≥140VS.<140– 44.7%vs.25.6%,p–value=0.002 and in patients who had DBP ≥ 90 as compared to those patients who had DBP < 90 (DBP: ≥ 90 VS. < 90 – 43.1% vs. 23.9%, p – value = 0.001). According to Bijupaul et al[15] in 2008 found that the prevalence of anemia in hypertensive patients was 16% and was higher in patients with uncontrolled hypertension(20%) than among those with well controlled hypertension(4%).Anemia may leads to higher risk of cardiovascular diseases in hypertensive patients.

Conclusion

The cumulative burden of anemia in patients having type2DM, HTN, and CAD, increased with increasing age and was more common in the female gender. The burden of anemia was higher in subsets of patients having CAD. The duration of NCDs was directly proportional to the burden of anemia.

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Conflict of Interest: Nil
Source of support:Nil

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