



Clinico - Pathological Study of A Herbo-Mineral Compound And *Guduchi Satwa* On Sickle Cell Anaemia w.s.r. To *Sannipatika Pandu*

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ABSTRACT: -

Introduction: *Sannipatika Panduroga*, described in Ayurveda classics resembles to the clinical features of Sick cell Anaemia (SCA). Sick cell Anaemia results from substitution of a single Amino Acid; Glutamic Acid in place of Valine at 6th position of the β globin polypeptide chain, which produce homozygous (HbSS) and heterozygous (HbAS), mainly two varieties of Sick cell Disease (SCD)

Materials and methods: A clinical study on 30 *Sannipatika pandu roga* patients, (15 patients each in Group-A and Group-B) were registered from OPD and IPD of Govt. Ayurvedic College and Hospital, Balangir, Odisha. The patients presented with the Subjective Parameters of *Panduta* (Pallor of the skin), *Durvalata* (Weakness), *Sadana* (Fatigue), *Angamarda* (Body ache), *Jwara* (Fever), *Swasa* (Dyspnoea), *Aruchi* (Anorexia), *Gourava* (Heaviness), *Chhardi* (Vomiting), *Mala-Mutra* and *Netraswetata* (pale colouration of urine, stool and eye) and Objective parameters as CBC, ESR Sickling test (24 hours method) and Hb Electrophoresis were selected for clinical study. Group-A patients were treated with *Herbo-Mineral Compound* (500mg) and Group-B patients with *Guduchi Satwa* (500 mg) twice daily in empty stomach with honey orally for 30 days respectively. The patients were assessed at 10 days interval up to 30 days in order to find the efficacy of both the trial drugs. The subjective and objective parameters were analysed statistically by Wilcoxon-W test and p-value.

Observation and result: There were 65.15% and 40.85% of improvement in signs and symptoms and 25% & 17.65% of increase in the level of Hb gm% in the patients of Group-A and Group-B were observed in this study respectively. The Statistically significant (P<0.05) result was revealed in both Group-A and Group-B but improvement was noticed more in Group-A.

Conclusion: -The overall study revealed that the trial on *Herbo-Mineral Compound* i.e., Group-A showed more efficacy than *Guduchi satwa* i.e, Group-B. The composition of *Herbo-Mineral Compound* helped more to develop the body immunity as well as maintain the haematological parameters rather than single *Guduchi satwa*. No adverse effects was noticed during clinical trial in both groups.

Key words: *Sannipatika Panduroga*, Sick cell Anemia, Herbo-Mineral Compound, *Guduchi Satwa*



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INTRODUCTION

In Ayurveda classics, there are 5 types of *Panduroga* i.e., *Vataja*, *Pittaja*, *Kaphaja*, *Sannipataja* and *Mridbhakshyanaja*.^{1,2,3,4}

Among 5 types of *Panduroga*, *Sannipatika pandu* resembles to the clinical features of Sickle cell Anaemia. Sickle cell Anaemia is an autosomal recessive DNA mutation disorder in which Valine amino acid is replaced by Glutamic acid in 6th position of β chain of haemoglobin and produce different abnormal haemoglobin, (Heterozygous (HbAS-Trait), Homozygous (HbSS -disease), Hb beta thalassemia, Hb beta-zero thalassemia) leads to chronic haemolytic Anaemia. Out of which HbAS and HbSS varieties are mainly located in western part of Odisha. In hypoxia condition the RBCs become rigid and sticky and manifested with sickle like shape or crescent moons shape. These irregularly shaped cells can get stuck in small blood vessels which can slow or block blood flow resulting severe pain and abnormalities.⁵

There are many uncountable minerals and herbal preparations available in Ayurveda classics, which are helping to treat Sickle cell Anemia and remarkable results are also found in mild to moderate degree of Sickle cell Anemia. Whereas symptomatic treatment are noticed in modern science which are not adequate to save the suffers. So, an attempt was taken to treat Sickle cell Anaemia with herbal and mineral formulation named as "Herbo-Mineral Compound" and its comparative study with herbal medication named as "*Guduchi Satwa*" in this research protocol.

AIMS AND OBJECTIVE

- To establish co-relation between *Sannipatika Pandu* with Sickle cell Anemia.
- To find out the effective treatment of Sickle cell Anemia in Ayurveda.
- To evaluate the effect of Herbo-Mineral Compound and *Guduchi Satwa*.

MATERIALS AND METHOD

CTRI Registration Number-

CTRI/2020/12/029673 (Registered on: 09/12/2020)

IEC Number-

1245/GAC &H, Dated:14/05/2019

Selection of the patients:

Total 30 patients of Sickle cell Anemia had been selected by a special proforma covering demography along with both Subjective and Objective parameters from OPD and IPD of Govt. Ayurvedic College and Hospital, Balangir. The Subjective parameters were *Panduta*, *Durvalata*, *Sadana*, *Angamarda*, *Jwara*, *Swasa*, *Aruchi*, *Gourava*, *Chhardi*, *Mala-Mutra* and *Netraswetata* and Objective parameters were CBC, ESR, Sickling and Hb Electrophoresis. The consent of patients was also taken before clinical trial.

Grouping: 30 patients were divided into two groups i.e, Group-A (15) patient's trial with *Herbo-Mineral Compound* and Group-B (15) trial with *Guduchi Satwa* with 500mg twice a day with honey for 30 days in empty stomach.

Inclusive Criteria⁶-

- Clinical features of Pandu (Anemia) along with positive sickling test.
- Hemoglobin >6gm/dl.
- Patients not having piles or hemorrhoids, anal fissure or local infection in anal canal.
- Age group - 14 to 60 years.

Exclusion Criteria-

- Age <14 and >60 years.
- Hemoglobin <6 gm/dl.
- Anemia induced by drugs.
- Malignancy and any life-threatening condition.
- Pregnant and lactating women.
- Patients taking immunosuppressive medicines like steroids etc.
- Viral hepatitis, Aplastic anemia, Osteoporosis and Osteopenia was excluded from the study.

h) Organ failure and other complication.

Criteria for Investigation:

CBC, ESR, Sickling and Hb Electrophoresis were investigated initially and in follow up periods.

SELECTION OF DRUGS:

Two medicines Herbo-Mineral Compound and *Guduchi Satwa* had been taken for clinical trial. The drugs of both medicines were identified by the experts of Dept. of *Dravyaguna* and *Rasashastra* and *Bhisajya Kalpana* which were approved by DRC and IEC of Govt. Ayurvedic College & Hospital and Sambalpur University. Medicines were prepared as per GMP certified method in Mini Pharmacy of College under the supervision of expert of *Rasashastra* and *Bhisajya Kalpana*. The sample of research medicines were sent to Quality control Laboratories of ALN Rao Memorial Ayurvedic Medical College and PG centre Koppa, Distt. Chikmagalur, Karnatka for Analytical study

Table No.-01; Showing the pharmacodynamics of Herbo-Mineral Compound and *Guduchi Satwa*

Name	Rasa (Essence)	Guna (Quality)	Veerya (Potency)	Vipaka (Post digestive effect)	Prabhava	Quantity Taken
Herbo-Mineral Compound						
<i>Guduchi Satwa</i>	<i>Kashaya, Tikta, Katu</i>	<i>Laghu Snigdha</i>	<i>Ushna</i>	<i>Madhura</i>	<i>Tridoshahara</i>	48 part(192mg)
<i>Amalaki</i>	<i>Amla, Madhura, Kashaya, Tikta, Katu</i>	<i>Guru, Sheeta, rukshya</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Tridoshahara (Mainly pitta samaka)</i>	24 part (96mg)

<i>Aswagandha</i>	<i>Katu, Tikta, Kashaya</i>	<i>Snigdha, Laghu</i>	<i>Ushna</i>	<i>Katu</i>	<i>Tridoshahara (Mainly Kapha, Vata)</i>	24 part(96mg)
<i>Maricha</i>	<i>Katu</i>	<i>Laghu, Teekshna, Sukhma</i>	<i>Ushna</i>	<i>Katu</i>	<i>Balances Kapha, Vata</i>	16part(64mg)
<i>Muktasukti pisti</i>	<i>Katu, Madhura, Lavana</i>	<i>Snigdha, Sheeta</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Balances Kapha, Pitta</i>	4part(16mg)
<i>Pravala pisti</i>	<i>Madhura, Amla, Kasaya</i>	<i>Laghu, Snigdha</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Tridoshahara (Mainly Kapha, Vata)</i>	4part(16mg)
<i>Sankha bhasma</i>	<i>Katu</i>	<i>Laghu, Rukshya, Teekshna</i>	<i>Ushna</i>	<i>Madhura</i>	<i>Tridoshahara (Mainly Kapha)</i>	4part(16mg)
<i>Roupya bhasma</i>	<i>Ksaya, Amla</i>	<i>Snigdha, Guru, Sara</i>	<i>Sheeta</i>	<i>Madhura</i>	<i>Tridoshahara</i>	1part(4mg)
<i>Guduchi Satwa</i>						
<i>Guduchi Satwa</i>	<i>Kashaya, Tikta, Katu</i>	<i>Laghu Snigdha</i>	<i>Ushna</i>	<i>Madhura</i>	<i>Tridoshahara</i>	1 part

Preparation of Trial Drug-1(Herbo-Mineral Compound):

Guduchi satwa was prepared by *satwa* preparation method at mini-Pharmacy. Cleaned and dried *Amalaki, Aswagandha* and *Maricha* were taken in specific quantity and grinded. Prepared powders were mixed well with *Guduchi satwa, Muktasukti pisti, Pravala pisti, Sankha bhasma* and *Roupya bhasma* in specific quantity under the supervision of Pharmacy Expert. The prepared Herbo-Mineral powder was packed in air tight container.

Preparation of Trial Drug-2 (*Guduchi Satwa*):

The collected *Guduchi* stems were thoroughly washed, cleaned by water and cut into small pieces around 1–2-inch length after removal of outer husk. The small pieces of *Guduchi* were crushed and grinded by grinder simultaneously

and prepared *Guduchi satwa* as per *satwa* preparation method.

Dose- Herbo-Mineral Compound 500mg and *Guduchi satwa* 500 mg twice daily in empty stomach with *Madhu* in Group A and Group B respectively.

Assessment Criteria

The Subjective parameters and Objective parameters as per Inclusion Criteria were fixed by the grading score from 0 to 3 according to the severity of disease and favorable shift to back. Both parameters were followed up 10th, 20th and 30th day of medication. The overall assessments were done considering the percentage of relief in both parameters and statistical evaluation was made.

OBSERVATION AND RESULT

The clinical study period of 30 patients were from 23-03-2020 to 05-03-2021. Within the aforesaid period the demography (Table No.-02) based on

Age-Sex-Religion etc., along with incidence of *Dasvidha Pariksha* (Table No.-03) were observed and assessed. The results obtained after completion of the trial were recorded in tabular forms along with graphical presentations as follows

Table no. 02; Demography Incidence of Registered Patients. (n=30)

Criteria	Maximum Percentage	Category
Age	43.33%	10-20 years
Sex	50%	Both Male & Female
Religion	100%	Hindu
Education status	96.7%	Literate
Occupation	60%, 23.3%	Student, Housewife
Socio- Economical status	90%	Middle class
Marital status	56.7%	Un-Married
Dietary habit	90%	Mixed diet
Addiction	50%,30%	Taking tea, Alcohol
Family history	86.7%	Present
Sleeping habit	60%	Disturb sleep
Bowel habit	76.7%	Abnormal

Table no. 03; Incidence of *Dashavidha- Pariksha* of Registered Patients. (n=30)

Criteria	Maximum Percentage	Category
<i>Prakriti</i>	53.4%	<i>Vatapitta</i>
<i>Vikriti</i>	100%	<i>Madhyama- vastha</i>
<i>Sara</i>	70%	<i>Madhyama-sara</i>
<i>Samhanan</i>	60%	<i>Madhyama</i>
<i>Pramana</i>	83.3%	<i>Madhyama sharira</i>
<i>Satwa</i>	86.7%	<i>Madhyama</i>
<i>Satmya</i>	70%	<i>Madhyama</i>
<i>Ahara Shakti</i>	86.6%	<i>Madhyama Ahara Shakti</i>
<i>Vyayama Shakti</i>	56.6%	<i>Madhyama Vyayama Shakti</i>
<i>Vaya</i>	76.7%	<i>Madhyamavastha</i>

The Subjective and Objective Parameters of both Group-A and Group-B were observed during clinical study. The percentage of improvement were also

observed and assessed after clinical trial which is placed here as Table No.-04.

Table No. 04; Showing the observation of total patients as per disease and percentage of Improvement in Group-A and Group-B. (n=30)

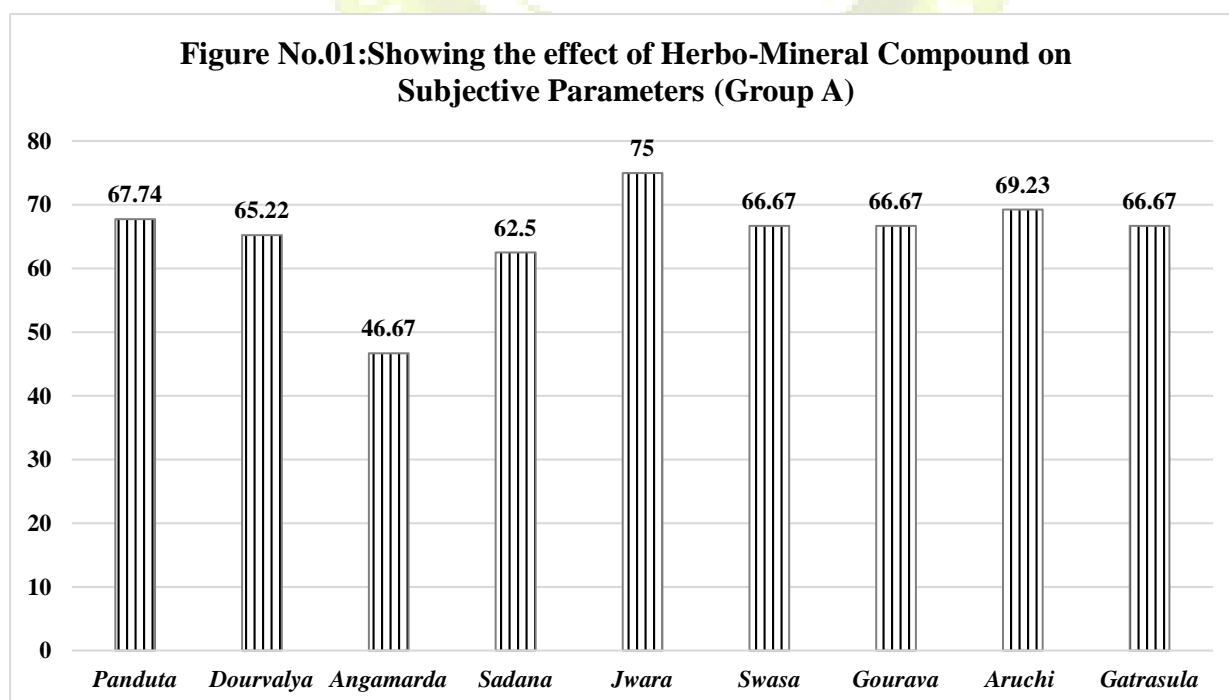
Sign/ Symptom	Group-A		Group-B		Group-A	Group-B
	Frequency	Percentage	Frequency	Percentage	% of improve.	% of improve.
Subjective Parameter						
<i>Panduta</i> (Pallor)	15	100	15	100	67.74	48.00
<i>Dourbalya</i> (Weakness)	12	80	11	73.3	65.22	42.86
<i>Angamarda</i> (Body ache)	10	66.7	11	73.3	46.67	38.46
<i>Sadana</i> (Fatigue)	10	66.7	9	60	46.67	50
<i>Jwara</i> (Fever)	4	26.7	3	20	62.50	33.3
<i>Swasha</i> (Dyspnoea)	2	13.3	1	6.7	75.00	50
<i>Gourava</i> (Heaviness)	7	46.7	4	26.7	66.67	25
<i>Aruchi</i> (Loss of appetite)	10	66.7	5	33.3	69.23	50
<i>Gatrasula</i> (Joint pain)	10	66.7	8	53.3	66.67	30
Objective Parameter						
TLC	15	100	15	100	50	50
ESR	15	100	15	100	7.14	9.43
Hb%	15	100	15	100	25	17.65
MCH	15	100	15	100	15	23.8
MCHC	15	100	15	100	12.5	13.3
MCV	15	100	15	100	33.3	33.3
PCV	15	100	15	100	9.09	25
TRBC	15	100	15	100	10	5.26

The observations made before and after treatment of Subjective parameters of Group-A

were assessed and the statistical analysis was carried out with the help of statistical method. (Table No.-05 and Figure No.01)

Table No.05: Showing the effect of Herbo-Mineral Compound on Subjective Parameters (Group A) (n=30)

Subjective parameters		Mean	Median	SD	Wilcoxon W	P-Value	% Effect	Result
<i>Panduta</i> (Pallor)	BT	2.07	2.00	0.70	-3.247 ^a	0.0012	67.74	<0.01 Sig
	AT	0.67	0.00	0.82				
<i>Dourbalya</i> (Weakness)	BT	1.53	2.00	1.13	-2.701 ^a	0.0069	65.22	<0.01 Sig
	AT	0.53	0.00	0.83				
<i>Angamarda</i> (Body ache)	BT	1.00	1.00	1.00	-2.460 ^a	0.0139	46.67	<0.05 Sig
	AT	0.53	0.00	0.83				
<i>Sadana</i> (Fatigue)	BT	1.07	1.00	0.88	-2.460 ^a	0.0139	62.50	<0.05 Sig
	AT	0.40	0.00	0.74				
<i>Jwara</i> (Fever)	BT	0.27	0.00	0.46	-1.732 ^a	0.0433	75.00	<0.05 Sig
	AT	0.07	0.00	0.26				
<i>Swasha</i> (Dyspnoea)	BT	0.20	0.00	0.56	-1.414 ^a	0.0483	66.67	<0.05 Sig
	AT	0.07	0.00	0.26				
<i>Gourava</i> (Heaviness)	BT	0.60	0.00	0.74	-2.449 ^a	0.0143	66.67	<0.05 Sig
	AT	0.20	0.00	0.41				
<i>Aruchi</i> (Loss of appetite)	BT	0.87	1.00	0.83	-2.714 ^a	0.0067	69.23	<0.01 Sig
	AT	0.27	0.00	0.59				
<i>Gatrasula</i> (Joint pain)	BT	1.00	1.00	0.93	-2.460 ^a	0.0139	66.67	<0.05 Sig
	AT	0.33	0.00	0.49				

Figure No.01: Showing the effect of Herbo-Mineral Compound on Subjective Parameters (Group A)

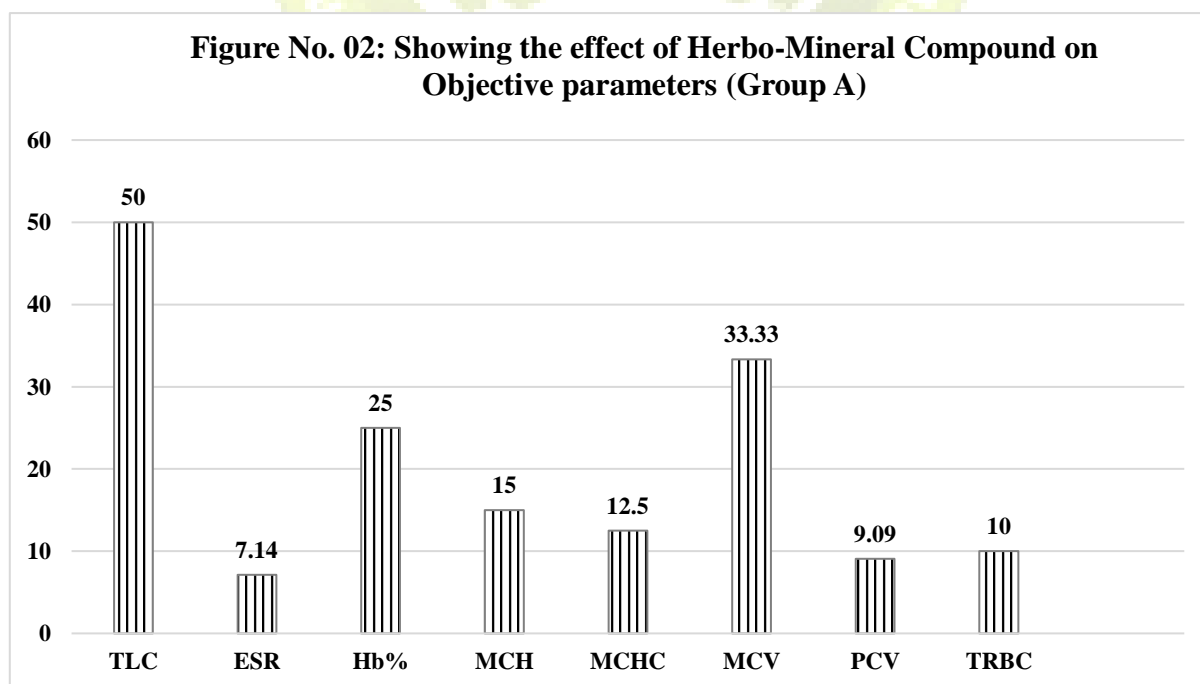
The observations made before and after treatment of Objective parameters of Group-A

were assessed and the statistical analysis was calculated with the help of statistical method. (Table No.-06 and Figure No.02)

Table No.06: Showing the effect of Herbo-Mineral Compound on Objective Parameters (Group A) (n=30)

Objective parameters		Mean	Median	SD	Wilcoxon W	P-Value	% Effect	Result
TLC	BT	1.20	1.00	0.86	-2.460 ^a	0.0139	50.00	<0.05 Sig
	AT	0.60	1.00	0.63				
ESR	BT	2.80	2.00	1.52	-1.999 ^b	0.0456	7.14	<0.05 Sig
	AT	3.00	3.00	1.51				
Hb%	BT	1.07	1.00	1.03	-2.236 ^a	0.0253	25.00	<0.05 Sig
	AT	0.80	1.00	0.68				
MCH	BT	1.33	1.00	0.62	-2.000 ^a	0.0455	15.00	<0.05 Sig
	AT	1.13	1.00	0.52				
MCHC	BT	1.07	1.00	0.70	-1.732 ^a	0.0433	12.50	<0.05 Sig
	AT	0.93	1.00	0.59				
MCV	BT	0.80	1.00	0.68	-2.000 ^a	0.0455	33.33	<0.05 Sig
	AT	0.53	1.00	0.52				
PCV	BT	0.73	1.00	0.59	-1.000 ^a	0.0483	9.09	<0.05 Sig
	AT	0.67	1.00	0.72				
TRBC	BT	1.33	1.00	0.62	-1.732 ^a	0.0433	10.00	<0.05 Sig
	AT	1.20	1.00	0.68				

Figure No. 02: Showing the effect of Herbo-Mineral Compound on Objective parameters (Group A)



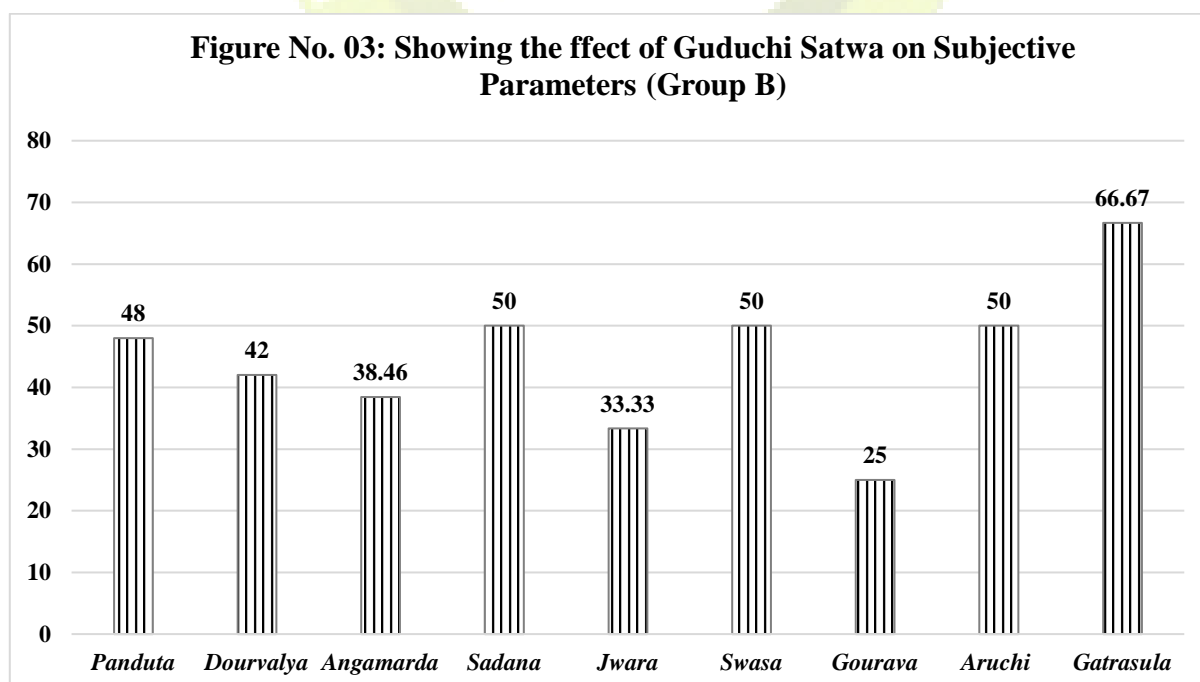
The effect of *Guduchi Satwa* was assessed on subjective parameters by before and after treatment study protocol and was calculated as

per Statistical method (Table No.07 and Figure No.03)

Table No.07: Showing the effect of *Guduchi Satwa* on Subjective Parameters (Group-B) (n=30)

Subjective parameters		Mean	Median	SD	Wilcoxon W	P-Value	% Effect	Result
<i>Panduta</i> (Pallor)	BT	1.67	2.00	0.72	-2.972 ^a	0.0030	48.00	<0.01 Sig
	AT	0.87	0.00	0.99				
<i>Dourbalya</i> (Weakness)	BT	0.93	1.00	0.70	-2.449 ^a	0.0143	42.86	<0.05 Sig
	AT	0.53	1.00	0.52				
<i>Angamarda</i> (Body ache)	BT	0.87	1.00	0.74	-2.236 ^a	0.0253	38.46	<0.05 Sig
	AT	0.53	1.00	0.52				
<i>Sadana</i> (Fatigue)	BT	0.67	1.00	0.62	-2.236 ^a	0.0253	50.00	<0.05 Sig
	AT	0.33	0.00	0.49				
<i>Jwara</i> (Fever)	BT	0.20	0.00	0.41	-1.000 ^a	0.0483	33.33	<0.05 Sig
	AT	0.13	0.00	0.35				
<i>Swasha</i> (Dyspnoea)	BT	0.13	0.00	0.35	-1.000 ^a	0.0483	50.00	<0.05 Sig
	AT	0.07	0.00	0.26				
<i>Gourava</i> (Heaviness)	BT	0.27	0.00	0.46	-1.000 ^a	0.0483	25.00	<0.05 Sig
	AT	0.20	0.00	0.41				
<i>Aruchi</i> (Loss of appetite)	BT	0.40	0.00	0.63	-1.732 ^a	0.0433	50.00	<0.05 Sig
	AT	0.20	0.00	0.41				
<i>Gatrasula</i> (Joint pain)	BT	0.67	1.00	0.82	-1.732 ^a	0.0433	30.00	<0.05 Sig
	AT	0.47	0.00	0.64				

Figure No. 03: Showing the effect of *Guduchi Satwa* on Subjective Parameters (Group B)

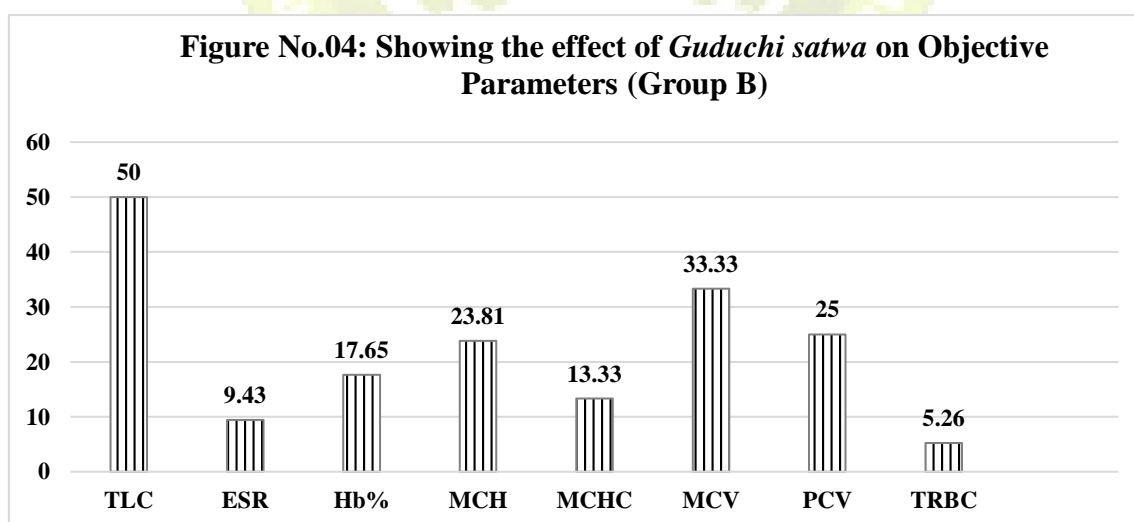


The effect of *Guduchi Satwa* was assessed on Objective parameters by before and after treatment study protocol and was calculated as

per Statistical method (Table No.08 and Figure No.04)

Table No.08: Showing the effect of *Guduchi Satwa* on Objective Parameters (Group-B) (n=30)

Objective parameters		Mean	Median	SD	Wilcoxon W	P-Value	% Effect	Result
TLC	BT	0.93	1.00	0.70	-2.460 ^a	0.0139	50.00	<0.05 Sig
	AT	0.53	1.00	0.52				
ESR	BT	3.53	4.00	1.68	-2.236 ^b	0.0253	9.43	<0.05 Sig
	AT	3.87	4.00	1.85				
Hb%	BT	1.13	1.00	0.52	-1.732 ^a	0.0433	17.65	<0.05 Sig
	AT	0.93	1.00	0.70				
MCH	BT	1.40	1.00	0.51	-2.236 ^a	0.0253	23.81	<0.05 Sig
	AT	1.07	1.00	0.46				
MCHC	BT	1.00	1.00	0.53	-1.414 ^a	0.0483	13.33	<0.05 Sig
	AT	0.87	1.00	0.64				
MCV	BT	1.00	1.00	0.65	-2.236 ^a	0.0253	33.33	<0.05 Sig
	AT	0.67	1.00	0.62				
PCV	BT	0.80	1.00	0.56	-1.732 ^a	0.0433	25.00	<0.05 Sig
	AT	0.60	1.00	0.51				
TRBC	BT	1.27	1.00	0.46	-1.000 ^a	0.0483	5.26	<0.05 Sig
	AT	1.20	1.00	0.56				



The assessment of Subjective parameters of Group-A and Group-B were assessed in order to find out the significant or non-significant of

result. The calculated value is placed here with as per Table No.09

Table No.09: Showing the assessment of Subjective Parameters before and after treatment in Group-A and Group-B (n=30)

Subjective parameters	Group	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value	Result
<i>Panduta</i> (Pallor)	Group A (15)	18.27	274.00	71.000	0.036	<0.05 Sig
	Group B (15)	12.73	191.00			
<i>Dourbalya</i> (Weakness)	Group A (15)	17.70	265.50	79.500	0.041	<0.05 Sig
	Group B (15)	13.30	199.50			
<i>Angamarda</i> (Body ache)	Group A (15)	16.50	247.50	97.500	0.045	<0.05 Sig
	Group B (15)	14.50	217.50			
<i>Sadana</i> (Fatigue)	Group A (15)	17.33	260.00	85.000	0.042	<0.05 Sig
	Group B (15)	13.67	205.00			
<i>Jwara</i> (Fever)	Group A (15)	16.50	247.50	97.500	0.043	<0.05 Sig
	Group B (15)	14.50	217.50			
<i>Swasha</i> (Dyspnoea)	Group A (15)	16.00	240.00	105.000	0.045	<0.05 Sig
	Group B (15)	15.00	225.00			
<i>Gourava</i> (Heaviness)	Group A (15)	18.00	270.00	75.000	0.034	<0.05 Sig
	Group B (15)	13.00	195.00			
<i>Aruchi</i> (Loss of appetite)	Group A (15)	18.10	271.50	73.500	0.055	<0.05 Sig
	Group B (15)	12.90	193.50			
<i>Gatrasula</i> (Joint pain)	Group A (15)	18.20	273.00	72.000	0.048	<0.05 Sig
	Group B (15)	12.80	192.00			

The assessment of Objective parameters of Group-A and Group-B were assessed in order to find out the significant or non-significant of

result. The calculated value is placed here with as per Table No.10.

Table No.10: Showing the assessment of Objective Parameters before and after treatment in Group-A and Group-B (n=30)

Objective parameters	Group	Mean Rank	Sum of Ranks	Mann-Whitney U	P-Value	Result
TLC	Group A (15)	16.10	241.50	103.500	0.047	<0.05 Sig
	Group B (15)	14.90	223.50			
ESR	Group A (15)	16.33	245.00	100.000	0.046	<0.05 Sig
	Group B (15)	14.67	220.00			
Hb%	Group A (15)	16.10	241.50	103.500	0.046	<0.05 Sig
	Group B (15)	14.90	223.50			
MCH	Group A (15)	14.67	220.00	100.000	0.045	<0.05 Sig
	Group B (15)	16.33	245.00			
MCHC	Group A (15)	15.57	233.50	111.500	0.050	<0.05 Sig
	Group B (15)	15.43	231.50			
MCV	Group A (15)	15.00	225.00	105.000	0.047	<0.05 Sig
	Group B (15)	16.00	240.00			
PCV	Group A (15)	14.70	220.50	100.500	0.045	<0.05 Sig
	Group B (15)	16.30	244.50			
TRBC	Group A (15)	16.03	240.50	104.500	0.046	<0.05 Sig
	Group B (15)	14.97	224.50			

DISCUSSION:

Sannipatika panduroga can be co-related with Sickle cell Anaemia. The main symptoms of Sickle cell Anaemia are yellowish skin, fatigue, generalized weakness, body ache and crisis, fever and anorexia,⁶ it can be compared with symptoms of *Sannipatika pandu* as mentioned in Ayurvedic Classics. But the *Nidana* of *Sannipatika pandu roga* doesn't correlate with Sickle cell Anemia as it is autosomal hereditary disease. The *samprapti* (Pathogenesis) of *Sannipatika pandu* co-related with Sickle cell Anemia as in both the type of *Srota Dusti* is *Sanga* (Vaso occlusion found in Sickle cell Anemia). Recently blood transfusion is the ideal procedure to maintain hemoglobin (Hb%) and to save life of Sickling patient but the administration of herbal and mineral preparations helps to avoid recurrent blood transfusion, minimizing the clinical findings and increase the hemoglobin (Hb%) percentage in blood, which are easily available, cost effective and safer to treat sickle cell Anaemia⁷.

The detail of *Sannipatika Panduroga* was discussed in the form of *Nidana* (causative factor), *Purvarupa* (Prodromal symptoms), *Rupa* (Symptoms), *Upasaya* (symptomatic treatment), *Samprapti* (pathogenesis) and treatment which are described in *Vrihatrayi and Laghutrayi classical books*. All these features were taken into consideration for this study as well as aetiology, pathogenesis, clinical features and treatment described in Modern science were also followed during research work.

The aim of present study was to study the effect of *Herbo-Mineral Compound* and *Guduchi Satwa* on the *Sannipatika panduroga*. *Herbo-Mineral Compound* was an *Anubhuta Yoga* which contains *Guduchi satwa*, *Amalaki*, *Aswagandha*, *Maricha*, *Muktasukti pisti*, *Pravala pisti*, *Sankha bhasma*, *roupya bhasma*

and *Guduchi Satwa* selected from *Guduchyadi varga of Bhavaprakash*. The whole study was performed in two groups i.e., 1. Group-A treated with *Herbo-Mineral Compound* and 2. Group-B treated with *Guduchi Satwa* 500mg twice a day with honey in empty stomach respectively.

Predominant rasa of *Herbo-Mineral-Compound* is *Katu, Tikta, Kasaya Rasa* (bitter, astringent, sour) *Having Madhura (sweet) And Katu Vipaka (bitter)*. Mainly *Katu, Tikta And Kasaya Rasa* act on *Kapha dosha* whereas *Madhura Vipaka* helps in alleviation of both *vata* and *Pitta dosha*. The drugs also poses *Ushna Veerya* (hot) act on *Kapha And Vata Dosha*. *Laghu (light), Rukshya (dry), Tiksha Guna (sharp)* act as *Kapha Shamaka And Snigdha Guna* act as *Vata Shamaka*. This drug is predominantly *Tridosahara*. It contains *Deepana Pachana* properties. (Table No.1)

Guduchi Satwa is having predominance of *katu, tikta and kashaya rasa*. which acts on the vitiated *kapha dosha*. *Guduchi* poses *laghu* and *Snigdha guna*. The vitiated *vata* is alleviated by virtue of *snigdha guna*. The drug poses *ushna veerya* which alleviates both *vata* and *kapha*. The drug has *madhura vipaka* as a result of which the *vata* and *pitta dosha* are alleviated. Also it has *deepan-pachan* property. Thus, the prepared medicine is potential to correct the agni i.e., *Jatharagni* and *Dhatwagni*, which helps in smooth management of body metabolism by which the disease is treated successfully⁸.

It was observed from demographical study (Table No.02) that most of the patients were from Middle aged (12-30 years), both male and female (50-50%), Hindu (100%) Unmarried (56.7%), Students (60%) having middle class socio-economic status (90%), addiction with tea- alcohol (50%,30%), Disturb sleeping habit (60%), Abnormal bowel habit (76.7%) and

mixed variety dietary habits affected due to non-maintenance of hygienic lifestyle and dietetic habit.

It was observed that maximum number of patients were having *Vata-Pitta Prakruti* (66%) with the predominance of *Madhyama Satwa-Sara-Samhanan-Satmya-Pramana-Jaranashakti-Vyayama Shakti And Madhyama Vaya*. (Table No.03)

Patients treated with *Herbo-Minearal Compound* (Group A), was observed more Statistically significant ($P < 0.05$) improvement in symptoms like *Panduta (Pallor)* (67.74%), *Dourvalaya* (weakness) (65.22%), *Angamarda* (body ache) (46.67%), *Sadana* (fatigue) (62.5%), *Jwara* (fever) (75%), *Swasha* (breathlessness) (66.67%), *Gourava* (heaviness) (66.67%), *Aruchi* (Anorexia) (69.23%) and *Gatrasula* (66.67%) than Group-B treated with *Guduchi satwa* ($P < 0.05$). *Panduta*, *Dourbalya*, and *Aruchi* Subjective parameters were Statistically Significant ($P < 0.01$) in Group-A. (Table No.05,07 and Figure No.01,03)

Regarding Haematological Findings Improvement was noticed equally statistically significant ($P < 0.05$) in both Group-A and Group-B but more improvement was revealed in Group-A

(Table No.06,08 and Figure No.02,04)

The overall assessment revealed that 10(66.6%) and 8(53.3%) patients of Group-A and Group-B respectively was noticed mild improvement. 3(20%) patients from Group-A and 6(40%) from Group-B were unsatisfactory. One patient from each group was under moderate improvement whereas only one patient of Group-A was improved marked in the study. (Table No.11 and Figure No.05)

In-Vitro Anti-Sickling effect:

An In-Vitro study to observed and understand the Anti-Sickling effect of *Guduchi Satwa* and

its associated Herbo-Mineral Compound on Sickle RBCs was conducted with the collaboration with the Department of Biochemistry, University of Delhi South Campus). The study was primarily based on lab-based incubation and subsequent microscopic studies, involving bright field microscopes (Nikon and Magnus brand) and compound microscope with auto-capture CCD camera available at the GAC Balangir laboratory (Lawrence and Mayo Brand.) Microscopic images were processed using the software Future Win Joe Version Version 1.0.0.0.

To assess the anti-sickling effect, RBC samples were collected from patients suffering with Sickle Cell Disease (SS) and Sickle Cell Carrier/Trait (AS) and subjected to further analysis. For the purpose of study, the blood samples were collected in pre-fabricated vacutainers / EDTA coated vials and stored in a cold, dry condition. To confirm the sickle cell disease / trait cases, the samples were subjected to Haemoglobin Electrophoresis and/or HPLC analysis. Further confirmation was obtained by subjecting the RBCs to induced sickling process by treatment with Sodium Metabisulfite as solvent in and incubating in hypoxic condition over 4 hours. This process enabled to observed the physical changes in the cellular morphology.

In order to study the anti-sickle effect of the drug, the same blood sample was mixed with Methanolic solution of *Guduchi Satwa* and Herbo-Mineral Compound at 250mg and 500mg dosage each using the same methodology of invitro sickling and the results were observed using the microscopic technique

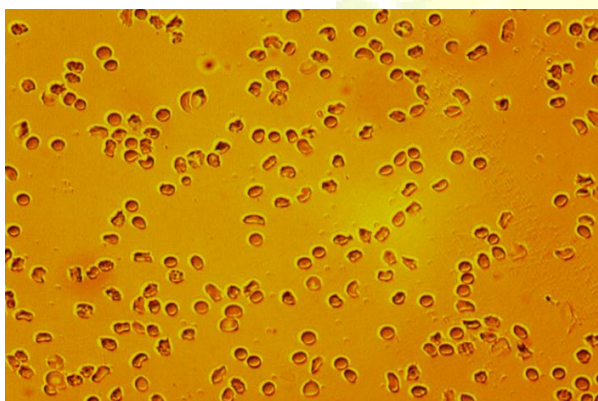
It was observed that both the dosage, 250mg and 500mg of *Guduchi Satwa* and Herbo-Mineral Compound did have anti-sickling effect but the 500mg dosage was found to be more effective in case of Herbo-Mineral Compound sample. In the case of the *Guduchi*

Satwa, the similar trend was observed, in the 500mg dose.

In a comparative study of the anti-sickling effect among *Guduchi Satwa* and Herbo-Mineral Compound, it was found that the HMC showed better results as compared to the GS. This may happen due to the presence of additional minerals and processed plant extracts, as compared to the raw plant extract alone.

For the future, we propose to have a further in-depth analysis, we intend explore the membrane potential of the RBCs, the role of ion exchange and various membrane stability assays. This will help to ascertain the role of sickling/anti-sickling compounds on the

Figure No.01: Sample-A at 0 hours



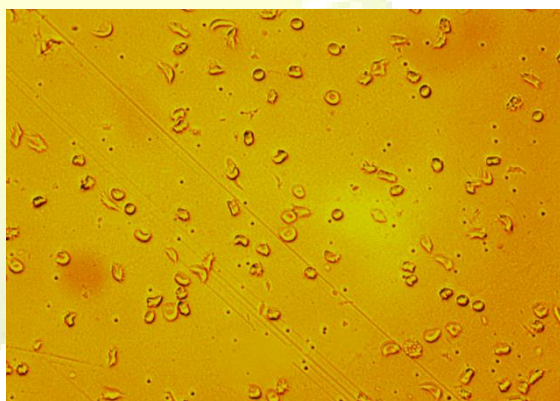
affected red blood cells in the sickle cell disease and sickle cell trait patients. This data can further be supplemented by software-based cell size and structure analysis which may give more rational input regarding the process of anti-sickle effect of any compound.

Microscopic Images:

Sample A mixed with Sodium Metabisulfite:

Figure No.01,02: It was observed that by Incubating the Sickle Red Blood Cells in Hypoxic Condition without the application of Drugs, the number of cells gradually reduces/becomes less in number after 4 hours

Figure No.02: Sample-A at 4 hours



Sample A Treated with Herbo-Mineral Compound in 250mg and 500mg:

Figure No. 03 and 04, provides digital images, the blood treated with Herbo-Mineral Compound (250mg and 500mg) at 4 hours respectively gives anti-sickling effect

Figure No.03: HMC (250mg) at 4 hours

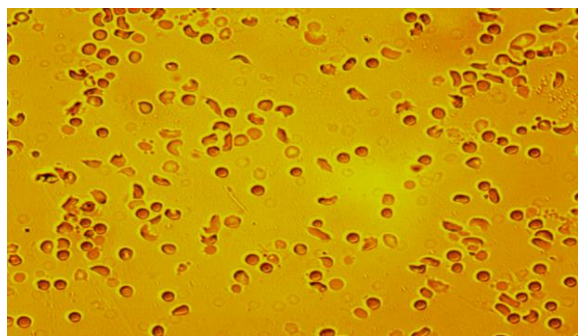


Figure No.04: HMC (500mg) at 4 hours

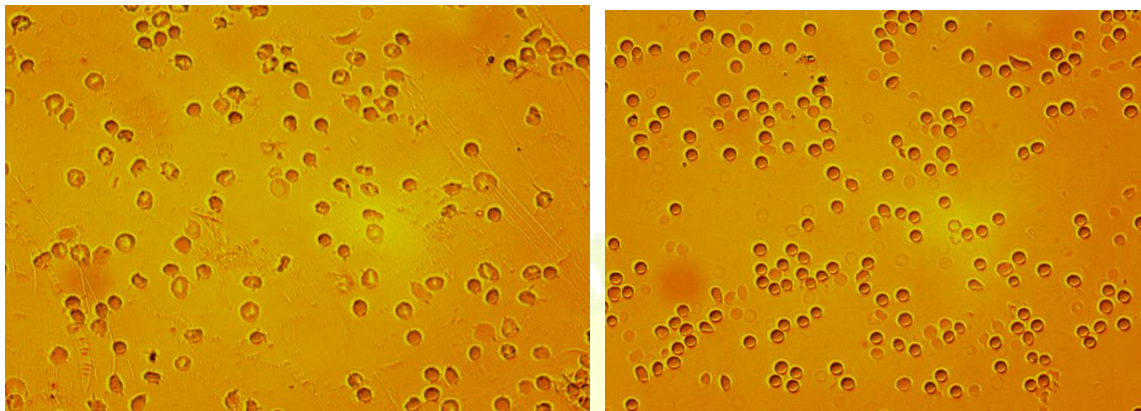


Sample A Treated with *Guduchi Satwa* in 250mg and 500mg:

Figure No. 05, 06, Showed mild anti-Sickling effect after treated with 250mg of *Guduchi Satwa* at 4 hour

Figure No.05: GS (250mg) at 4hours

Figure No.06: GS (500mg) at hour



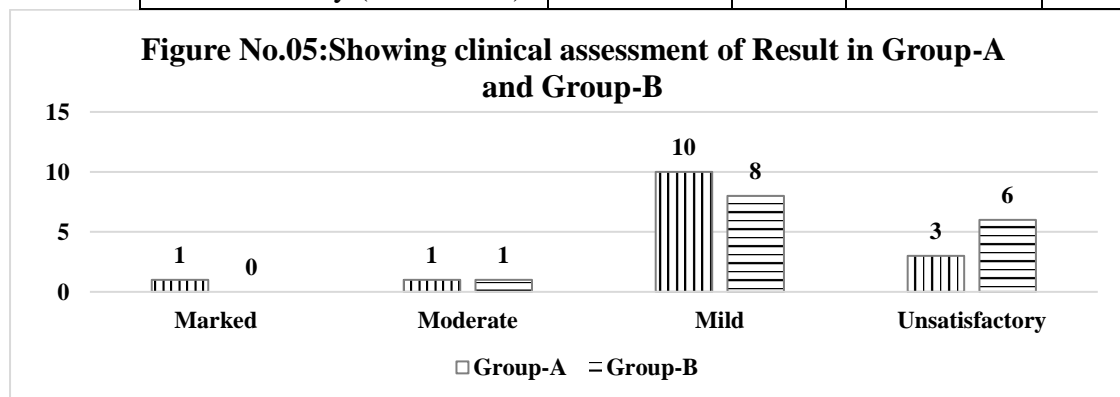
In nutshell it was revealed that, P-Values ($P < 0.05$) for Subjective and Objective parameters were statistically significant in both Group-A and Group-B. Further it showed that,

mean rank for Group A was greater than Group B and effect of *Herbo-Mineral Compound* (Group A) was more than *Guduchi satwa* (Group B). (Table No.09 and Table No.10)

Table No.11; Showing clinical assessment of Result in Group-A and Group-B

Clinical Assessment	After Treatment			
	Group-A		Group-B	
	No. of Patients	%age	No. of Patients	%age
Marked Improvement (76-100%)	01	6.7	00	00
Moderate Improvement (51-75%)	01	6.7	01	6.7
Mild Improvement (26-50%)	10	66.6	08	53.3
Unsatisfactory (below 25%)	03	20	06	40

Figure No.05: Showing clinical assessment of Result in Group-A and Group-B



In assessing overall effect of therapy, it was seen that

- Overall comparison showed that best results was obtained in Group-A (Herbo-Mineral Compound) in the form of better clinical response and statistical significance.
- Present study reveals that the selected Herbo-Minerals drugs has potential effect on *Sannipatika Panduroga* with the added advantage of being free from side effects.

CONCLUSION:

Sannipatika Pandu roga is *Pitta pradhana Tridoshaja vyadhi*. *Pitta* is responsible for the normal colour of the body but when it gets vitiated, affects *Rakta* (blood) and thus loss of complexion or *Panduta* (pallor) occurs. Though *Pitta* is *pradhana dosha* in *Pandu roga*, *Vata* and *Kapha dosha* also plays crucial role in manifestation of *Sannipatika Pandu roga*. The study revealed that both *Herbo-Mineral Compound* and *Guduchi Satwa* helps to develop the body immunity as well as maintain the haematological parameters. **But Herbo-Mineral Compound was more effective in Group-A than Guduchi Satwa in Group-B.** Present study was carried out with certain limitations like smaller samples. Forth coming researchers may pursue further study in a larger sample size over a period of longer duration. No side effect was noticed during clinical trial in both groups.

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