IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 9 Ver. 7 (September. 2018), PP 81-89
www.iosrjournals.org

The Effect of Herpes Simplex Virus Infection on Different Blood Parameters: A Transverse Study

Mohammad Asaduzzaman[*1], Md. Akram Hossen Mrida[1], Md. Najmul Hasan[1], Md. Omar Faruq[1], Farha Matin Juliana[2], Mohammod Johirul Islam, Mohammad Shahriar Kabir[4]

[1]*Department of Biochemistry, Primeasia University, Banani, Dhaka, Bangladesh*
[2]*Department of Biochemistry and Molecular Biology, Jahangirnagar University, Savar, Dhaka, Bangladesh*
[3]*Department of Biochemistry and Molecular Biology, Mawlana Bhashani Science & Technology University, Tangail, Bangladesh*
[4]*Department of Chemistry, Primeasia University, Banani, Dhaka, Bangladesh*
**Corresponding Author: Mohammad Asaduzzaman*

Abstract
Introduction: This study was aimed to detect the effects of HSV infection on different blood parameters using RBC, Hb, MCV, MCH, HCT/PCV, WBC, Neutrophil, Eosinophil, Lymphocytes, Monocytes, Platelets, MPV, PCT and RBS. Methods: The patients were divided into two groups according to their sex. Most of the patients were in between 20-40 years. For male highest number of patients found in the 30-40 years age group and then 20-30, 10-20 years age group. For female highest number of patients found in the 20-30 years age group and then 30-40 years age group. One hundred twenty two (122) HSV infected patients attending Popular Diagnostic Limited, Uttara, Dhaka, Bangladesh was selected for this study. A specimen of 2.5 ml of blood was collected from each patient in EDTA container. Automated hematological analyzer (Sysmex XT-2000i) was used to measure the parameters. Data were analyzed statistically by using IBM SPSS Statistics, version 18. Results: Percentile results showed decrease level of RBC (41.18%), Hb (35.14%), MCV (17.34%), MCH (44.23%) and HCT (34.62%) for female participants compare to male. WBC, lymphocytes and RBS levels were found with moderately increased values between both the sexes. Except these all other parameters such as Neutrophil, Eosinophil, Monocytes, platelets, MPV and PCT were within the standard criteria. Conclusion: No statistically significant conclusion could be drawn for this study on HSV infection effects on different blood parameters.

Keywords: *HSV, RBC, Hb, MCV, MCH, HCT/PCV, WBC, Neutrophil, Eosinophil, Lymphocytes, Monocytes, platelets, MPV, PCT and RBS*

Date of Submission: 06-09-2018 Date of acceptance: 21-09-2018

I. Introduction

Herpes simplex viruses (HSV) have worldwide distribution and are found in the most remote human Populations. Worldwide 60 to 95% in adults are found with either HSV-1 or HSV-2. HSV-2 is less common than HSV-1, with rates increasing as people age. HSV-1 rates are between 70% and 80% in populations of low socioeconomic status and 40% to 60% in populations of improved socioeconomic status. Prevalence of HSV-2 in those between the ages of 15 and 50 is about 535 million as of 2003 or 16% of the population, with highest rates in sub-Sahara Africa and lowest in Western Europe, and with greater rates among women and those in the developing world. In the United States 57.7% of the population is infected with HVS1 and 16.2 % are infected with HSV-2, and prevalence of HSV-2 was 39.2% in blacks and 20.9 % in women. Herpes infection is the predominant cause of genital ulcers throughout the world, with increased use of HSV PCR for detection of HSV infection. HSV-1 causes primarily mouth, throat, face, eye, and central nervous system infections, whereas HSV-2 causes primarily anogenital infections. However, each may cause infections in all areas. HSV infection is contracted through direct contact with an active lesion or body fluid of an infected person. Clinical presentations of HSV include, skin and mucosa infection, orofacial herpes, genitalherpes, herpetic whitlow, herpes encephalitis, cognitive deficits of bipolar disorder and Alzheimer's disease. Diagnosis by detection of HSV antibodies by PCR, and the new Immunodot glycoprotein G-specific (IgG) test is more than 98% specific at discriminating HSV-1 from HSV2. Management by antiviral medications, can reduce the frequency, and topical anesthetic to relieve itching and pain. Prevention by barriers such as condom, and the use of antiviral agents.(1)

Pathophysiology

Exposure to HSV at mucosal surfaces or abraded skin sites permits entry of the virus and initiation of its replication in cells of the epidermis and dermis. Initial HSV infection is often subclinical, without apparent lesions. In animal models and human subjects, both clinical acquisition and subclinical acquisition are associated with sufficient viral replication to permit infection of either sensory or autonomic nerve endings. After transversing the neuroepithelial gap and entering the neuronal cell, the virus or, more likely the nucleocapsid is transported intra-axonally to the nerve cell bodies in ganglia. For HSV-1 infection, trigeminal ganglia are most commonly infected, although extension to the inferior and superior cervical ganglia also occurs. With genital infection sacral nerve root ganglia (S2 to S5) are most commonly affected. In humans, the interval from inoculation of virus to peripheral tissue to spread to the ganglia is unknown.(1)

A ganglia is the region where viral replication occurs and contagious neural tissue during primary infection only. After initial inoculation of the neural ganglion, virus spreads to other mucosal skin surfaces by centrifugal migration of infectious virions through peripheral sensory nerves. Virus spreading mode explains the characteristics development of new lesions distant from the initial crop of vesicles in patients with primary genital or orofacial HSV infection, the large surface area over which these vesicles may be visualized, and the recovery of virus from neural tissue distant from neurons innervating the inoculation. Contagious spread of virus may also take place via autoinoculation and allow further extension of disease. During approximately 25% of primary HSV-2 infections viremia is present, and its presence may affect the natural history of HSV-2 disease in terms of site, severity and frequency of reactivation. Many studies of this present time suggest that rate of reactivation is far more frequent and dynamic than previously recognized. Anogenital PCR swabs are used daily and it showed that the median shedding rate of the 95% of patients with a positive HSV-2 antibody who shed virus is 25% of days, with a wide range of interpretation variability (range, 2% to 75%). Clinical studies demonstrate that host factors also influence a reactivation. Severity of this disease is found more among immunocompromised patients.(1)

Following an initial infection with type of HSV antibodies develop that prevents reinfection with type same virus type-a person with a history of orofacial infection caused by HSV-1 cannot contract herpes whitlow or a genital infection caused by HSV-1. When a couple is monogamous then a seronegative female runs a greater than 30% per year risk of contracting an HSV infection from a seropositive male partner. If at first an oral HSV-1 infection is contracted, seroconversion will have occurred after 6 weeks to provide protective antibodies against a future HSV-1 infection. Herpes simplex contains double-stranded DNA.(1)

Clinical Manifestation

HSV infection causes several distinct medical disorders. Common infection of the skin or mucosa may affect the face and mouth (orofacial herpes), genitalia (genital herpes), or hands (herpetic whitlow). More serious disorders occur when the virus infects and damage the eyes (herpes keratitis), or invades the central nervous system, damaging the brain (herpes encephalitis). People with immature or suppressed immune systems, such as newborns, transplant recipients, or people with AIDS, are prone to severe complications from HSV infections. HSV infection has also been associated with cognitive deficit of bipolar disorder, and Alzheimer's disease, although this often dependent on the genetics of the infected person.(1)

In all cases, HSV never removed from the body by the immune system. Following a primary infection, the virus enters at the site of primary infection, migrates to cell body of the neuron, and becomes latent in the ganglion. As a result of primary infection; the body produces antibodies to particular type of HSV involved, preventing a subsequent infection of that type at a different site. In HSV-1-infected individuals, seroconversion after an oral infection prevents additional HSV-1 infections such as whitlow, genital herpes, and herpes of the eye. Prior HSV-1 seroconversion seems to reduce the symptoms of later HSV-2 infection, although HSV-2 can still be contracted. Many people infected with HSV-2 display no physical symptoms-individuals with no symptoms are described as asymptomatic or as subclinical herpes.(1)

Neonatal herpes simplex is a HSV infection in an infant. It is a rare but serious condition, usually caused by vertical transmission of (HSV-1 or 2) from mother to newborn. During immunodeficiency, herpes simplex can cause unusual lesions in the skin. One of the most striking is the appearance of clean linear erosions in skin creases, with appearance of a knife cut. Herpetic sycosis is a recurrent or initial herpes simplex infection affecting primarily the hair follicles. Eczema herpeticum is an infection with herpes virus with chronic atopic dermatitis may result in spread of herpes simplex throughout the eczematous areas. The exact cause of Bell's palsy, a type of facial paralysis, is unknown; it may be related to reactivation of HSV-1. The theory has been contested, however, since HSV is detected in large numbers of individuals having never experienced facial paralysis, and higher levels of antibodies for HSV are not found in HSV-infected individuals with Bell's palsy compared to those without.(1)

CBC Parameters

A complete blood count (CBC) is a blood test used to evaluate your overall health and detect a wide range of disorders, including anemia, infection and leukemia.[2] A complete blood count (CBC) normally include: White cells (Neutrophils, Lymphocytes, Eosinophils, Basophils, Red Blood cells, Hemoglobin, Hematocrit, Red Blood Cell Indices (MHC, MCHC, MCV and RDW), Platelets, Mean platelet volume (MPV).[3] It has been searched Google, PubMed, Medline, RefSeek, Citeseer, Google Scholar, academia.edu, Wolfram Alpha, iSeek Education and ResearchGate.net up to July 2018 to find any relationship between HSV infection and CBC parameters. No data has been found regarding these issues.

Random Blood Sugar (RBS)

Chronic inflammation is involved closely and early on in the pathogenesis of type 2 diabetes. Viral infection of the pancreas, but not islets, can lead to induction of *fas* gene on β-cells, which renders them susceptible to Fas/Fas-ligand-mediated apoptosis and resulting in a significant degree of clinically manifest diabetes. HSV-1 DNA might reside in surviving HSV-1-infected mice in a "latent" state in pancreas. HSV-1 infection can cause the pancreas multiple small foci of hemorrhagic necrosis in humans and could induce the production of cytokines and inflammation response. Additionally, levels of cellular ATP and lactate and mitochondrial membrane potential are decreased at the late stage of infection with HSV. Synthesis of mitochondrial proteins and phospholipid synthesis in mitochondria in HSV-1-infected cells progressively decreases, which could be associated with dysregulation of intramyocellular fatty acid metabolism and insulin resistance. The inflammation related with abnormal function of β-cells and mitochondrial dysfunction after HSV-1 infection might be helpful to elucidate the association of HSV-1 infection with type 2 diabetes observed.[4]

In this study our aim was to detect the effects of HSV infection on some blood parameters using RBC, Hb, MCV, MCH, HCT/PCV, WBC, Neutrophil, Eosinophil, Lymphocytes, Monocytes, platelets, MPV, PCT and RBS.

II. Materials And Methods

Study design

The study was cross-sectional study to monitor the effects of HSV infection on different biological parameters attending for medical treatment at the Popular Diagnostics Limited, Uttara, Dhaka, Bangladesh.

Study Location

The study was conducted among the HSV infected patients at Popular Diagnostics Limited during January 2018 to August 2018. It is located at Uttara, Dhaka, Bangladesh. Popular Diagnostics Limited was chosen for this study because this institute is one of the best health institutes in Bangladesh.

Study Subjects

122 HSV infected patients.

Control Subjects

122 healthy individuals.

Study Time

January 2018 to August 2018.

Study Samples

Whole blood from participants is drawn by venipuncture into dipotassium ethylenediamine-tetraacetate (K2-EDTA)-containing evacuated Vacutainer tubes (Becton Dickinson, Franklin Lakes, NJ) after informed consent was obtained. Samples were packaged according to CDC guidelines and transported by courier in insulated containers to this CLIA-certified laboratory. Most samples are delivered within 4 hours of collection. Samples held overnight before delivery are kept at room temperature (65-76°F).[5]

RBC (indices), WBC, Platelet (indices) test method

The Sysmex XT-2000i uses the electric resistance detecting method (impedance technology) with hydro dynamic focusing to measure RBC, PLT, MPV, MCV write out on first reference, and HCT. Fluorescence flow cytometry is used to measure WBC, Diff, the optical PLT count, and the reticulocyte count. The system employs a 633nm semi-conductor laser for flow cytometry analysis. For the measurement by flow cytometry of the proportional count, expressed as percent of the total WBC, of neutrophils (NEUT), lymphocytes (LYMPH), monocytes (MONO), and eosinophils (EOS), white cells are stained with fluorescent

dyes that bind to both DNA and RNA. Side Scatter (SSC) is employed to determine the internal complexity of the cell-the size, shape, and density of the nucleus and granules of the cell. Fluorescence and scatter measurements are combined to characterize white cell populations. Basophils (BASO) are measured separately using cell size and SSC properties. Hb is measured photocolorimetrically using SLS-HGB, a cyanide-free method.[5]

The reagents required for the operation of the Sysmex XT-2000i are supplied by Sysmex America (Mundelein, IL) and are listed as follows:[5]

Reagent[5]	**Function**[5]
Cellpack	RBC/PLT and Hb Diluent; rinsing of instrument; hydrodynamic focusing
Stromatolyser-4DL	Diff lysing reagent
Stromatolyser-4DS	Diff stain
Stromatolyser-FB	Diluent for WBC count and lyses all cells except BASO
Sulfolyser	Non-cyanide Hb lyse (sodium lauryl sulphate)
Ret-Search (II)	Dilutes sample for reticulocyte analysis
Ret-Search (II) Dye	Stains reticulocytes and platelets for analysis

HCT and MCV are direct measurements on the Sysmex XT-2000i. The MCV is an average of all RBC size measurements collected in the impedance counter. The HCT is the sum of all the RBC size measurements and reported in proportion to the total volume of the analysis sample. Calculated red cell indices are MCH write out first reference, MCHC write out first reference, and RDW. RDW is reported on the Sysmex XT as both standard deviation from the mean red cell size (RDW-SD) and as coefficient of variation from the mean (RDW-CV).[5]

The Sysmex XT-2000i provides 2 PLT counts. One is an impedance count that both enumerates the platelets (I-PLT) and estimates MPV. The other is an optional optical count obtained in 1 of the flow analysis channels (O-PLT). The instrument also performs an optional reticulocyte count in 1 of the flow analysis channels. RBCs are stained, counted, and measured for size and fluorescence. Counts are expressed as percent of RBC (RET%).[5]

This laboratory operates under Clinical Laboratory Improvement Act (CLIA) certification. Calibration of the instrument is confirmed each day using 2 levels of controls (Sysmex e-Check Hematology Control for Sysmex X-Series Analyzers, Sysmex America), according to the manufacturer's recommendations. These recommendations are consistent with CLIA Interpretive Guidelines 493.1256(a)-(c) and 493.1256(d), Standard: Control procedures. Repeated analysis of a sample obtained from a healthy donor is used daily to confirm instrument precision, as per CLIA Interpretive Guideline 493.1253(b)(1)(i)(B), Precision (Reproducibility).[5]

Statistical Analysis

Data were assessed using the Statistical Package for Social Science (IBM SPSS Statistics, version 18, IBM Corporation, SPSS Inc. Chicago, III, USA) and Microsoft Office Excel 2007.

The Chi-Square statistic is most commonly used to evaluate Tests of Independence when using a crosstabulation. It presents the distributions of two categorical variables simultaneously, with the intersections of the categories of the variables appearing in the cells of the table. The Test of Independence assesses whether an association exists between the two variables by comparing the observed pattern of responses in the cells to the pattern that would be expected if the variables were truly independent of each other. Calculating the Chi-Square statistic and comparing it against a critical value from the Chi-Square distribution allows the researcher to assess whether the observed cell counts are significantly different from the expected cell counts. The Chi-Square statistic appears as an option when requesting a crosstabulation in SPSS. The output is labeled Chi-Square Tests; the Chi-Square statistic used in the Test of Independence is labeled Pearson Chi-Square. It is easier to simply examine the p-value provided by SPSS. To make a conclusion about the hypothesis with 95% confidence, the value labeled Asymp. Sig. (which is the p-value of the Chi-Square statistic) should be less than 0.05 (which is the alpha level associated with a 95% confidence level).[6]

If p-value is less than 0.05 than we can conclude that the variables are not independent of each other and that there is a statistical relationship between the categorical variables.[6]

III. Results

In this study 122 infected patients were participated, and among them 48 participants were male and 74 patients were female. In the male subjects 10.42% (5) were in the 10-20 years age group. 27.08% (13), 39.58% (26), 18.75% (9), 4.17% (2) and 0.00% (0) male participants were in the 20-30, 30-40, 40-50, 50-60, and 60-70 years age group consecutively. In the female subjects 8.11% (6) were in the 10-20years age group. 50.00% (37), 35.14% (26), 5.41% (4), 0.00% (0) and 1.35% (1) female participants were in the 20-30, 30-40, 40-50, 50-60,

and 60-70 years age group consecutively. For male highest number of patients found in the 30-40 years age group and then 20-30, 40-50 years age group. For female highest number of patients found in the 30-40 years age group and then 20-30, 40-50 years age group (Table-1).

Table-1: Distribution of HSV infected patients among different age and sex groups (n=122)

Age (Years)	Sex				Total	%
	Male	**%**	**Female**	**%**		
10-20	5	10.42	6	8.11	11	9.02
20-30	13	27.08	37	50.00	50	40.98
30-40	19	39.58	26	35.14	45	36.89
40-50	9	18.75	4	5.41	13	10.66
50-60	2	4.17	0	0.00	2	1.64
60-70	0	0.00	1	1.35	1	0.82
Total	48	100.00	74	100.00	122	100.00

Among the male subjects 11.11% (5) were with less than standard RBC count, 51.11% (23) with standard and 37.78% (17) with above the standard count. For the female subjects 41.18% (28) with less than the standard count, 50.00% (34) with standard and 8.82% (6) with above the standard count (Table-2). P-value for male=0.714 and for female=0.184.

Table-2: RBC count between different sex of the HSV infected patients (Male=45, Female=68)

RBC (millions/µL)		**Male**	**%**	**RBC (millions/µL)**		**Female**	**%**	**Average %**
Below	4.5	5	11.11	Below	4	28	41.18	26.15
Standard	4.5-5.5	23	51.11	Standard	4-5	34	50.00	50.55
Above	5.5	17	37.78	Above	5	6	8.82	23.30

In respect of the male subjects 80.85% (38) were with standard Hb content, 17.02% (8) with less than the standard and 2.13% (1) with above the standard content. Scenario was similar for female subjects. 60.81% (45) with standard content; and 35.14% (26) with less than the standard and 4.05% (3) with above the standard content. 2.13% (1) male and 4.05% (3) female subjects were found with above the standard Hb content (Table-3). P-value for male=0.455 and for female=0.398.

Table-3: Hb content between different sex of the HSV infected patients (Male=47, Female=74)

Hb (grams/dL)		**Male**	**Percentage**	**Hb (grams/dL)**		**Female**	**Percentage**	**Average %**
Below	13	8	17.02	Below	12	26	35.14	26.08
Standard	13-17	38	80.85	Standard	12-15	45	60.81	70.83
Above	17	1	2.13	Above	15	3	4.05	3.09

MCV was measured for both types of sex group. For male 90.32% (28) and female 73.08% (38) subjects were in standard range; 9.68% (3) male and 25.00% (13) female were in the below the standard range. 0.00% (0) male and 1.92% (1) female subjects were found with above the standard MCV value (Table-4). P-value for MCV=0.243.

Table-4: MCV of RBC between different sex group of the HSV infected patients (Male=31, Female=52)

MCV (femtoliters/cell)		**Male**	**Percentage**	**MCV (femtoliters/cell)**		**Female**	**Percentage**	**Average %**
Below	79	3	9.68	Below	79	13	25.00	17.34
Standard	79-96	28	90.32	Standard	79-96	38	73.08	81.70
Above	96	0	0.00	Above	96	1	1.92	0.96

MCH was measured for both types of sex group. For male 74.19% (23) and female 55.77% (29) subjects were in standard range of MCV value; 19.35% (6) male and 44.23% (23) female were in the below the standard range. 6.45% (2) male and 0.00% (0) female subjects were found with above the standard MCH content (Table-5). P-value for MCH=0.282.

Table-5: MCH content of RBC between different sex group of the HSV infected patients (Male=31, Female=52)

MCH (picograms/cell)		**Male**	**Percentage**	**MCH (picograms/cell)**		**Female**	**Percentage**	**Average %**
Below	27	6	19.35	Below	27	23	44.23	31.79
Standard	27-32	23	74.19	Standard	27-32	29	55.77	64.98
Above	32	2	6.45	Above	32	0	0.00	3.23

HCT for 96.77% (30) male and 63.46% (33) female subjects were within the standard range; 0.00% male and 34.62% (18) female were below the standard range (Table-6). P-value for HCT/PCV, male=0.385 and female=0.924.

Table-6: HCT/PCV Percentage between different sex of the HSV infected patients (Male=31, Female=52)

HCT/PCV (%)		Male	Percentage	HCT/PCV (%)		Female	Percentage	Average %
Below	40	0	0.00	Below	37	18	34.62	17.31
Standard	40-54	30	96.77	Standard	37-47	33	63.46	80.12
Above	54	1	3.23	Above	47	1	1.92	2.57

Among the male participants 80.85% (38) were counted with standard range and 19.15% (9) were with above the standard range of the WBC count. 77.03% (57) female subjects' WBC count found within the standard range, 18.92% (14) were with above the standard count and 2.70% (2) found with less than 4000cells/µL (Table-7). P-value for total WBC=0.324.

Table-7: T-WBC count between different sex group of the HSV infected patients (Male=47, Female=74)

T-WBC (Cells/µL)		Male	Percentage	TWBC (Cells/µL)		Female	Percentage	Average %
Below	4000	0	0.00%	Below	4000	2	2.70%	1.35
Standard	4000-11000	38	80.85%	Standard	4000-11000	57	77.03%	78.94
Above	11000	9	19.15%	Above	11000	14	18.92%	19.04

Both male and female (95.75% and 91.78%) HSV infected subjects showed standard neutrophils count those were within 40-75%. 4.26% (2) male and 4.11% (3) female subjects neutrophils count were below the 40-75% range (Table-8). P-value for neutrophils=0.016.

Table-8: Neutrophil count between different sex groups of the HSV infected patients (Male=47, Female=73)

Neutrophil (%)		Male	Percentage	Neutrophil (%)		Female	Percentage	Average %
Below	40	2	4.26	Below	40	3	4.11	4.19
Standard	40-75	45	95.74	Standard	40-75	67	91.78	93.76
Above	75	0	0.00	Above	75	3	4.11	2.06

In this study most of the male and female (74.47% and 78.08%) subjects eosinophils count were within the standard range (2-6%). 6.38% male respondents showed count below the standard limit and for female it was only 4.11% (Table-9). P-value for eosinophils=0.238.

Table-9: Eosinophil count between different sex group of the HSV infected patients (Male=47, Female=73)

Eosinophil (%)		Male	Percentage	Eosinophil (%)		Female	Percentage	Average %
Below	2	3	6.38	Below	2	9	12.33	9.36
Standard	2-6	35	74.47	Standard	2-6	57	78.08	76.28
Above	6	9	1.91	Above	6	7	9.59	5.75

Lymphocytes count showed that most of the male and female (72.34% and 75.34%) subjects were within standard count (20-40%). In case of more than standard count 27.66% were male and 21.92% were female subjects (Table-10). P-value for lymphocytes=0.368.

Table-10: Lymphocytes count between different sex group of the HSV infected patients (Male=47, Female=73)

Lymphocyte (%)		Male	Percentage	Lymphocytes (%)		Female	Percentage	Average %
Below	20	0	0.00	Below	20	2	2.74	1.37
Standard	20-40	34	72.34	Standard	20-40	55	75.34	73.84
Above	40	13	27.66	Above	40	16	21.92	24.79

In our study for male not a single subject was found with low number of monocyte and also for female no subject was found with low monocytes. 100.00% (47) male and 98.63% (72) female subjects monocytes counts were within the standard range (2-10%) (Table-11). P-value for monocytes=0.175.

Table-11: Monocytes count between different sex group of the HSV infected patients (Male=47, Female=73)

Monocytes (%)		Male	Percentage	Monocytes (%)		Female	Percentage	Average %
Below	2	0	0.00	Below	2	0	0.00	0.00
Standard	2-10	47	100.00	Standard	2-10	72	98.63	99.32
Above	10	0	0.00	Above	10	1	1.37	0.69

Only 2.17% (1) male and 1.37% (1) female respondents were found with thrombocytopenia. 93.48% (43) male and 91.78% (67) female respondents were fit with standard platelet count. 4.35% (2) male and 6.85% (5) female precipitants platelets count found above the standard limit (Table-12). P-value for platelets=0.420.

Table-12: Platelets count between different sex of the HSV infected patients (Male=46, Female=73)

PL (Cells/µL)		Male	Percentage	PL (Cells/µL)		Female	Percentage	Average %
Below	150,000	1	2.17	Below	150,000	1	1.37	1.77
Standard	150,000-450,000	43	93.48	Standard	150,000-450,000	67	91.78	92.63
Above	450,000	2	4.35	Above	450,000	5	6.85	5.60

Regarding average size or MPV of platelet 90.00% (27) male and 91.67% (44) female subjects showed standard phenomena. Only 3.33% (1) male and 4.17% (2) female showed substandard phenomena. 6.67% (2) male and 4.16% (2) female subjects were found with above the standard MPV limit (Table-13). P-value for MPV=0.603.

Table-13: MPV of platelet cell between different sex of the HSV infected patients (Male=30, Female=48)

MPV (femtoliters)		Male	Percentage	MPV (femtoliters)		Female	Percentage	Average %
Below	9	1	3.33	Below	9	2	4.17	3.75
Standard	9-13	27	90.00	Standard	9-13	44	91.67	90.84
Above	13	2	6.67	Above	13	2	4.16	5.41

Increased PCT level found for 3.45% (1) male and 0.00% (0) female respondents. It was found below the standard limit for 0.00% (0) male and 0.00% (0) female. Standard amount of PCT found in 96.99% (28) male and 100.00% (48) female of the HSV infected patients (Table-14). P-value for PCT=0.686.

Table-14: PCT Percentage between different sex of the HSV infected patients (Male=29, Female=48)

PCT (%)		Male	Percentage	PCT (%)		Female	Percentage	Average %
Below	0.01	0	0.00	Below	0.01	0	0.00	0.00
Standard	0.01-9.99	28	96.55	Standard	0.01-9.99	48	100.00	98.28
Above	9.99	1	3.45	Above	9.99	0	0.00	1.72

High RBS level found for 14.29% (4) male and 29.17% (14) female respondents. It was found below the standard limit for 7.14% (2) male and 0.00% (0) female. Standard content of RBS found in 78.57% (22) male and 70.83% (34) female of the HSV infected patients (Table-15). P-value for PCT=0.100.

Table-15: RBS content between different sex of the HSV infected patients (Male=28, Female=48)

RBS (mmol/L)		Male	Percentage	RBS (mmol/L)		Female	Percentage	Average %
Below	4.4	2	7.14	Below	4.4	0	0.00	3.57
Standard	4.4-7.8	22	78.57	Standard	4.4-7.8	34	70.83	74.70
Above	7.8	4	14.29	Above	7.8	14	29.17	21.73

IV. Discussion

In this study our target group was HSV infected patients. Our patient's number was 122. Among patients 48 were male and 74 were female. For male highest number of patients were found in the 30-40 years age group and then 20-30, 40-50 years age group. For female highest number of patients were found in the 30-40 years age group and then 20-30, 40-50 years age group. A red RBC count is a blood test that your doctor uses to find out how many RBC somebody has. It's also known as an erythrocyte count. The test is important because RBCs contain hemoglobin, which carries oxygen to your body's tissues.[7] Among the male subjects 11.11% were observed with less than standard RBC count and 41.18% female were with less than the standard count. The increased result for woman may come due to menstrual bleeding. Bone marrow in the center of the bone needs iron to make hemoglobin, the part of the red blood cell that transports oxygen to the body's organs. Without adequate iron, the body cannot produce enough hemoglobin for red blood cells. The result is iron-deficiency anemia.[8] For Hb male subjects 80.85% were with standard content, 17.02% with less than the standard and 2.13% with above the standard content; and for female subjects 60.81% with standard content and 35.14% with less than the standard and 4.05% with above the standard content. Regarding MCV standard range for both the sexes are same and is 79-96 femtoliters/cell. For male 90.32% and female 73.08% subjects were in standard range; 9.68% male and 25.00% female were in the below the standard range. The average mass of Hb per RBC in a sample of blood is MCH. MCH value is diminished in hypochromic anemias. Measured MCH's

standard range for both the sexes are same and is 27-32 picograms/cell. For male 74.19% and female 55.77% subjects were in standard range; 19.35% male and 44.23% female were in the below the standard range. The HCT, also known by several other names such packed cell volume (PCV), is the volume percentage of red blood cells in blood. It is normally 40-54% for men and 37-47% for women. For male 96.77% and female 63.46% subjects were within the standard range; 0.00% male and 34.62% female were below the standard range. Normal WBC range is usually between 4,000 and 11,000 per microliter of blood. Among the male participants 80.85% were counted with standard range and 19.15% were with above the standard range. 77.03% female subjects' WBC count found within the standard range, 18.92% were with above the standard count and 2.70% found with less than 4000cells/µL. Neutrophils count is derived by multiplying the WBC count times the percent of neutrophils in the differential WBC count. The percent of neutrophils consists of the segmented (fully mature) neutrophils) + the bands (almost mature neutrophils). The normal range is 40-75% of the WBC. 95.75% male and 91.78% female HSV infected subjects showed standard neutrophils count those were within 40-75%. 4.26% male and 4.11% female subjects neutrophils count were below the 40-75% range. 74.47% male and 78.08% female subjects eisinophils count were within the standard range (2-6%). 6.38% male respondents showed count below the standard limit and for female it was only 4.11%. 72.34% male and 75.34% female subjects were within standard count (20-40%) of lymphocytes. 27.66% male and 21.92% female subjects count were more than standard range. A low number of monocytes in the blood (monocytopenia) can be caused by anything that decreases the overall white blood cell count, such as a bloodstream infection, chemotherapy, or a bone marrow disorder. No subject was found with low number of monocytes. 100.00% male and 98.63% female subjects monocytes counts were within the standard range. A low platelet count is below 150,000. If platelet count is below 50,000, risk of bleeding is high. Even every day activities can cause bleeding. A lower-than-normal platelet count is called thrombocytopenia. Only 2.17% male and 1.37% female respondents were found with thrombocytopenia. 93.48% male and 91.78% respondents were fit with standard platelet count. 4.35% male and 91.78% female precipitants platelet count found above the standard limit. MPV is a machine-calculated measurement of the average size of platelets found in blood and is typically included in blood tests as part of the CBC. Regarding average size of platelet 90.00% male and 91.67% female subjects showed standard phenomena. Only 3.33% male and 4.17% female showed substandard phenomena. PCT is a biomarker that exhibits greater specificity than other proinflammatory markers (eg, cytokines) in identifying patients with sepsis and can be used in the diagnosis of bacterial infections. Increased PCT level found for 0.00% male and 0.00% female respondents. It was found below the standard limit for 3.45% male and 0.00% female. Standard amount of PCT found in 96.55% male and 100.00% female of the HSV infected patients. Random Blood Sugar (RBS) test is performed on a sample of blood to measure level of Glucose in blood. It is performed to confirm Diabetes Mellitus and also during treatment and after treatment of Diabetes Mellitus. Increased RBS level found for 14.29% male and 29.17% female respondents. It was found below the standard limit for 7.14% male and 0.00% female. Standard content of RBS found in 78.57% male and 70.83% female HSV infected patients. Yuhua *et al.* showed a significant association of HSV-1 infection with type 2 diabetes. Their all subjects were hepatitis C virus antibody seronegative, so the confounding relationship between hepatitis C virus infection and type 2 diabetes can be excluded.[(2)] All the data were analyzed by using SPSS and found non-significant ($P>0.005$).

V. Conclusion

In conclusion we found decrease level of RBC (41.18%), Hb (35.14%), MCV (17.34%), MCH (44.23%) and HCT (34.62%) for female participants compare to male. WBC, lymphocytes and RBS levels were found with moderately increased values between both the sexes. Except these all other parameters were within the standard criteria. Large scale investigation is needed to carry out to get a conclusion on the effect of HSV infection on different biological parameters.

References

[1]. Murtaza Mustafa, EM Illzam, RK Muniandy, AM Sharifah, MK Nang, B Ramesh (2016). Herpes simplex virus infections, Pathophysiology and Management. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS). 15:7(III):85-91.

[2]. Complete Blood Count (cited 2018 August 6). [Internet]. © 1998-2018 Mayo Foundation for Medical Education and Research (MFMER). Retrieved from https://www.mayoclinic.org/tests-procedures/complete-blood-count/about/pac-20384919.

[3]. Complete Blood Count (cited 2018 August 6). [Internet]. Wikimedia Foundation, Inc. Last edited 2018 August 5. Retrieved from https://en.wikipedia.org/wiki/Complete_blood_count.

[4]. Yuhua Sun**,** Weidong Pei**,** Yongjian Wu and Yuejin Yang (2005). An Association of Herpes Simplex Virus Type 1 Infection With Type 2 Diabetes. Diabetes Care. 28:2:435-436.

[5]. Hill VL, Simpson VZ, Higgins JM, Hu Z, Stevens RA, Metcalf JA, Baseler M. Evaluation of the Performance of the Sysmex XT-2000i Hematology Analyzer With Whole Bloods Stored at Room Temperature. Laboratory Medicine. 2009; 40(12):709-718.

[6]. Asaduzzaman M, Shobnam A, Farukuzzaman *et al*. Assessment of red blood cell indices, white blood cells, platelet indices and procalcitonin of chronic kidney disease patients under hemodialysis. Int J Health Sci Res. 2018; 8(8):98-109.

[7]. Red Blood Cell Count (cited 2018 August 23). [Internet]. Medically reviewed by Deborah Weatherspoon, PhD, RN, CRNA on April 6, 2017- Written by Jacquelyn Cafasso and Ana Gotter. Retrieved from https://www.healthline.com/health/rbc-count.

[8]. [The Basics of Anemia (cited 2018 August 23). [Internet]. WebMD. © 2005 - 2018 WebMD LLC. Retrieved from https://www.webmd.com/a-to-z-guides/anemia-rare-types#1.

Mohammad Asaduzzaman*" The Effect of Herpes Simplex Virus Infection on Different Blood Parameters: A Transverse Study". IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 9, 2018, pp 81-89.