

# Association of Microbial Infections with Psychological Stress Patients

Qasim Hamadi Abid<sup>1\*</sup>, Alaa Jawad Hassan<sup>2</sup>

<sup>1</sup>Department of Medical Laboratory Techniques, Alsafwa University College, Iraq.

<sup>2</sup>Department of Biology, College of Science, University of Babylon, Babylon, Iraq

Email: [qasim.hamadi@alsafwa.edu.iq](mailto:qasim.hamadi@alsafwa.edu.iq)

Email: [alnajaralaa71@gmail.com](mailto:alnajaralaa71@gmail.com).

## Abstract

**Background:** Stress was associated with certain psychological diseases such as Alzheimer's (AD), Schizophrenia and Major Depression diseases. **Objectives:** The objective of current study was to Finding the relationship between microbial infections and psychological stress diseases. **Materials and methods:** 5 ml of blood were collected from patients and apparently healthy control (AHC) groups for viral diagnosis , The stool samples were collected from patients and AHC group for bacterial and parasitological diagnosis. **Results:** The results of viral diagnosis appeared that HSV-1 test in Alzheimer, Schizophrenia and major depression patients' groups was (50%), (50%) and (60%) respectively. The results of bacterial diagnosis illustrated that Alzheimer, Schizophrenia and Major depression patients groups in *H. pylori* was (35%), (25%) and (40%) respectively, *E. coli* was (55%) (65%) and (70%) respectively, *Salmonella* ssp. was (20%) (15%) and (20%) respectively, *Klebsiella* ssp. was (15%) (20%) and (15%) respectively and *Proteus* ssp. was (30%), (25%) and (25%) respectively. Results of parasitological diagnosis showed that *Giardia lamblia* in Alzheimer, schizophrenia and major depression patients groups was (35%) (20%) and (25%) respectively, *E. histolytica* was (15%) (10%) and (20%) respectively and *Cryptosporidium parvum* was (20%) (10%) and (25%) respectively. **Conclusion:** From of current study concluded that Microbial infection was associated with psychological stress patients, because the stress leads to minimize the activity and efficiency of immune response against foreign antigens.

**Keywords:** Stress, Alzheimer, Schizophrenia, Major Depression, HSV-1 and *H.pylori*.

## 1. Introduction

Stress is unavoidable in today's world, and numerous studies have shown that psychological stress has an impact on immunological function (1). Stress was associated with certain psychological diseases such as (AD) is a deterioration nervous disease marked by neuron degeneration, memory damage, learning impairment, and major changes in personality and behavior (2). One of the most challenging issues for newlyweds that has a negative psychological and social impact is infertility (3). Another disease associated with psychological stress was Schizophrenia Schizophrenia is a type of mental illness characterized by negative symptoms like decreased motivation and expressiveness as well as cognitive deficiencies like poor executive functions, memory, and mental processing speed. It is also characterized by psychotic symptoms like hallucinations, delusions, and disorganized speech (4). In addition, major depression disease (MDD) was also related to the psychological stress that are a global concern and the top source of burden and impairment worldwide (5). Herpes viruses are desirable candidates for a function in schizophrenia disorder because of their capacity to develop latency in the human body (6). Numerous research have shown a correlation between the prevalence of Alzheimer's disease and gram-negative bacteria like *E. coli* (7). Since psychological circumstances might

lead to an affinity for infectious diseases, further research revealed that chronic psychiatric patients tend to have low self-control, poor personal cleanliness, long-term institutionalization, and extremely low self-care. *Giardia lamblia* was the most prevalent parasite (8).

## 2. Materials and Methods

### Study groups and blood samples collection

The present study was conducted on 90 individual their ages ranged from 19-92 years. The study population was divided into four groups: first group include 30 of apparently healthy control (AHC) group and three patients' groups which include 60 of patients with psychological stress distributed into 20 patients for each Alzheimer, schizophrenia and major depression diseases. Five ml of blood were collected from patients and apparently healthy control (AHC) groups , by using disposable syringe then transferred to a plain tube and left to clot at room temperature (20-25°C) for 15 minutes. The clotted blood was centrifuged at 2500 rpm for 15 minutes; and then, serum was collected and distributed into aliquots of 0.25 ml in Eppendorf tubes for vial diagnosis The stool samples were collected from patients and apparently healthy groups. Samples were transported to the laboratory on ice in sealed bag. A fresh liquid or unformed stool sample is collected in a sterilized container. Once it has been collected, the stool sample should be taken to the laboratory

directly or refrigerated and taken to the laboratory immediately possible for bacterial and parasitical diagnosis (9).

### Viral diagnosis

The levels of HSV-1 in serum was estimated by using ELISA kit(China / Sunlong).

## 3. Bacterial Diagnosis

Identification of enteric bacteria(*E. coli*, *Salmonella*, *Proteus*, *Klebsiela*) by studying morphological characteristics and culture media that used ( MacConkey Agar, Nutrient Agar, Nutrient broth, Salmonella-Shigella Agar (S-S agar), Eosin-Methylene Blue Agar (EMB), Xylose Lysine Deoxycholate Agar (XLD), Selenite F Broth, Simmon Citrate Agar and Triple Sugar Iron Agar (TSI) , also by microscopic properties by staining the isolated bacteria with gram's stain as well as by biochemical tests (oxidase test, catalase test, indole test, methyl red test, vogues –proskauer test, citrate utilization test, urease test, and triple sugar iron test).

### Helicobacter pylori Ag cassette

(10) developed a quick technique for the qualitative detection of *Helicobacter pylori* in faces.

### Parasitical diagnosis

Immuno-chromatography kit used to detection of *Giardia lamblia*, *E. histolytica* and *Cryptosporidium parvum* in faces.

## 4. Statistical Analysis

The data were presented as odd ratio, Chi-squared (2-test) which has an anticipated count of fewer than 5, was used to assess the connection between any two categorical variables according to (11).

### Ethical approval

The study was carried out in conformity with the ethical standards set forth in the Helsinki Declaration. Before a sample was taken, it was done with the patient's verbal and analytical consent. A local ethics committee examined and approved the study protocol, subject information, and permission form in accordance with document number 1049 (containing the number and the date in 12/2/2022) to receive this approval.

## 5. Results

### Viral diagnosis

#### Herpes Simplex Virus (HSV-1)

**Table (1): Percentage of herpes simplex virus (HSV-1) in psychological stress patients groups and AHC control.**

Groups	No.	HSV-1				total	
		Positive		Negative		No.	%
		No.	%	No.	%		
AHC group	30	0	0	30	100	30	100%
Alzheimer patients	20	10	50	10	50	20	100%
Schizophrenia patients	20	10	50	10	50	20	100%
Major Depression patients	20	12	60	8	40	20	100%
total	90	32	35.56	58	64.44	90	100%

### Bacterial diagnosis

**Table (2): Association of psychological stress patients (Alzheimer, Schizophrenia and depression diseases) and AHC groups with bacterial infections .**

Groups	Test result	H. Pylori	E. coli	Salmonella	Klebsiella	Proteus	Total
		N(%)	N(%)	N(%)	N(%)	N(%)	N (%)
AHC group	positive	0(0)	8(26.67)	0(0)	0(0)	0(0)	8 (5.33)
	negative	30(100)	22(73.33)	30(100)	30(100)	30(100)	142 (94.67)
Alzheimer Patients group	positive	7(35)	11(55)	4(20)	3(15)	6(30)	31 (31)
	negative	13(65)	9(45)	16(80)	17(85)	14(70)	69 (69)
Schizophrenia Patients group	positive	5(25)	13(65)	3(15)	4(20)	5(25)	30 (30)
	negative	15(75)	7(35)	17(85)	16(80)	15(75)	70 (70)
Major Depression patients group	positive	8(40)	14(70)	4(20)	3(15)	5(25)	34 (34)
	negative	12(60)	6(30)	16(80)	17(85)	15(75)	66 (66)
Total	positive	20(22.22)	46(51.11)	11(12.22)	10(11.11)	16(17.78)	103 (22.89)
	negative	70(77.7)	44(48.89)	79(87.78)	80(88.89)	74 (82.22)	347 (77.11)

### Parasitical diagnosis

**Table (3): Association of psychological stress patients and HAC groups with parasitic infections.**

Groups	N	Test result	G. lamblia	E. histolytica	C. parvum	Total
			N(%)	N(%)	N(%)	N(%)
AHC group	30	positive	0(0)	0(0)	0(0)	0(0)
		negative	30(100)	30(100)	30(100)	90(100)
Alzheimer Patients group	20	positive	7(35)	3(15)	4(20)	14(23.33)
		negative	13(65)	17(85)	16(80)	46(76.67)
Schizophrenia Patients group	20	positive	4(20)	2(10)	2(10)	8(13.33)
		negative	16(80)	18(90)	18(90)	52(86.67)
Major Depression patients group	20	positive	5(25)	4(20)	5(25)	14(23.33)
		negative	15(75)	16(80)	15(75)	46(76.67)
Total	90	positive	16(17.78)	9(10)	11(12.22)	36(13.33)
		negative	74(82.22)	81(90)	79(87.78)	234(86.67)

## 6. Discussion

### Association of viral infections with

## psychological stress diseases

The present results showed that Alzheimer patients the 50% of infection was HSV-1 test positive and HSV-1 test negative (table ,1) compared with AHC group and these results in coordinated with previous studies (12) that showed a relationship between persistent HSV-1 Infection and AD. schizophrenia patients are formed 50% in HSV-1 test positive and HSV-1 test negative compared with AHC group and these results were confirmed by the results of (13) that showed there is a possible effect of viral infections on early neurodevelopment, and these viral agents can show neurotropism to regions associated with negative symptoms and there are links between the brain regions thought to be associated with positive, negative, and cognitive symptoms in patients with schizophrenia. major depression patients are formed 60% in HSV-1 test positive, while HSV-1 test negative are formed 40% compared with AHC group and these results were in consistent with the study of (14) that showed Herpes simplex virus-1 (HSV-1) infection is reported to be associated with depression.

## Association of bacterial infections with psychological stress diseases.

Table (2) showed that Alzheimer patients groups revealed a positive result for *H. pylori* reached to (35%) compared with AHC groups and these results was consistent with study of (15) that showed Alzheimer disease (AD), parkinson's disease, atherosclerosis, and cardiovascular ischemia are among the non-gastric disorders that are linked to *H. pylori* infection. *E. coli*, *Salmonella* ssp., *Klebsiella* and *Proteus* ssp. revealed a positive results which reached to (55%),(20%),(15%),(30%) respectively in Alzheimer patients in comparison with AHC group and these results were consistent with the study of (16) showed that different bacteria, including *Salmonella*, *E. coli*, *Klebsiella*, and *Proteus* were found in AD brains; their presence in the brain was caused by post-mortem contamination. Schizophrenia patients' groups revealed positive results for *H. pylori* reached to (25%) compared with AHC groups and these results was consistent with study of (17) that indicated schizophrenia and *H. pylori* are associated with higher endocrine problems. *E. coli*, *Salmonella* ssp., *Klebsiella* and *Proteus* ssp. revealed a positive results which reached to (65%),(15%),(20%),(25%) respectively in schizophrenia patients in comparison with AHC group and these results coordinated with previous studies(18) show that exposure to a range of infections is linked to the future emergence of schizophrenia or psychosis in offspring. Major depression patients' groups revealed positive results for *H. pylori* reached to (40%) compared with HAC groups and these results coordinated with previous studies (19) showed that Verifying the risk of mood disorders in people with *H. pylori*-associated atrophic gastritis (AG). *E. coli*, *Salmonella* ssp.,

*Klebsiella* and *Proteus* ssp. revealed a positive results which reached to (70%),(20%), (15%),(25%) respectively in major depression patients in comparison with AHC group and these results was consistent with the study of (20) showed that Psychiatric diseases including major depressive disorder(MDD) may be affected by recently identified connections between the brain and the gastrointestinal flora.

## Association of parasitological infections with psychological stress diseases

Positive results of present study (Table,3) showed that the percentage for prevalence of *E. histolytica* in (Alzheimer, schizophrenia and Major depression diseases) are 15%, 10% and 20% respectively compared with AHC group and these results coordinated with previous studies (21) showed that prevalence of *E. histolytica* in psychotic patients was 10.9% in Ethiopia and 10.34% in Tanzania respectively. Positive results showed that percentage for prevalence of *Giardia lamblia* in (Alzheimer, schizophrenia and Major depression diseases) are 35%, 20% and 25% respectively compared with AHC group and these results was consistent with the recent studies (21) that showed prevalence of *G. lamblia* in psychotic patients was 3.0% in Ethiopia and Nigeria, 5.8% from Bahir Dar and 4.0% in Northern Iran respectively. Also, the positive results showed that the percentage of infection by *Cryptosporidium parvum* in (Alzheimer, schizophrenia and Major depression diseases ) are 20%, 10% and 25% respectively compared with AHC group and these results was augmented by the study of (21) that found only three (0.7%) subjects had *Cryptosporidium parvum* infection. In the clinical group, there is a considerable association between psychiatric morbidities and passive coping methods (22).

## 7. Conclusion

In conclusion from the results of current study, it was concluded that Microbial infection was associated with psychological stress patients , because the stress leads to minimize the activity and efficiency of immune response against foreign antigens.

## References

- 1.Segerstrom, S.C. and Miller, G.E. Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. *Psychol Bull.*, (2004). 130(4):601±30.
- 2.Deture, M. A., and Dickson, D. W. The neuropathological diagnosis of Alzheimer's disease.*Mol.Neurodegener* (2019)..14:32.
3. Mohammad, A. Assessment of Psychosocial Status and Spiritual Beliefs of a Sample of Infertile Men in Baghdad City/Iraq. *Medical Journal of Babylon* (2018), Volume 15, Issue 2, Pages 139-144.
- 4.Hany, M., B. Rehman, Y. Azhar, and J. Chapman. 'Schizophrenia.' in, *StatPearls* (StatPearls Publishing).

(2021).

5. Tauscher, J., Kapur, S., Verhoeff, N.P., Hussey, D.F., Daskalakis, Z.J., Tauscher-Wisniewski, S., Wilson, A.A., Houle, S., Kasper, S and Zipursky, R.B. Brain serotonin 5-HT(1A) receptor binding in schizophrenia measured by positron emission tomography and [11C] WAY-100635. *Archives of General Psychiatry.* (2002). 59: 514–520.

6. Murray, P. K.; Rosenthal, K. S.; Kobayasi, G. S. and Pfaller, M. A. *Medical Microbiology.* St. Louis: C.V. Mosby. (2002).

7. Fu, Y.; N. Zhou, Y.; Yu, H.; Zhang, Y.; Sun, M.; Zhang, X.; Chen, Y. and Q. Yu, 'Profiling of schizophrenia-associated serum peptides by MALDI-TOF-MS'. *J Neural Transm (Vienna).* (2020). 127: 95–101.

8. Khalili, B.; Imani, R. and Boostani, S. Intestinal Parasitic Infections in Chronic Psychiatric Patients in Sina Hospital, Shahre-Kord, Iran. *Jundishapur J Microbiol.* (2013). 6(3): 252–5.

9. Dacie, J.V. and Lewis, S. *Practical haematology.* 6Ed. burgh. churchill. (2005).

10. Shimoyama, T. and Kato, C. Applicability of a monoclonal antibody-based stool antigen test to evaluate the results of *Helicobacter pylori* eradication therapy., (2009). May 62(3): 225.

11. Armitage, P., Berry, G. and Matthews, J.N.S. *Statistical methods in medical research.* John Wiley and Sons. (2008).

12. De Chiara, G.; Piacentini, R.; Fabiani, M.; Mastrodonato, A.; Marcocci, M.E.; Limongi, D.; Napoletani, G.; Protto, V.; Coluccio, P. and Celestino, I. Recurrent herpes simplex virus-1 infection induces hallmarks of neurodegeneration and cognitive deficits in mice. *PLoS Pathog.* (2019). 15: e1007617.

13. Houenou, J.; d'Albis, M.A.; Daban, C.; Hamdani, N.; Delavest, M. and Lepine, J.P. Cytomegalovirus seropositivity and serointensity are associated with hippocampal volume and verbal memory in schizophrenia and bipolar disorder. *Prog Neuropsychopharmacol Biol Psychiatry.* (2014) 48:1428.

14. Jing, Y.; Yan, W.; Xiaomeng, C.; Ping, L.; Bolun, C.; Shiqiang, C.; Li, L.; Lu, Z.; Mei, M.; Xin, Q.; Chujun, L.; Yumeng, J.; Cuiyan, W.; Sen, W.; Xi, W.; Yujie, N. and Feng, Z. Association between herpes simplex virus 1 exposure and the risk of depression in UK Biobank. (2020).

15. Tan, H. J. and Goh, K. L. Extragastrintestinal manifestations of *Helicobacter pylori* infection: facts or myth? A critical review. *J Dig Dis.* (2012). 13(7), 342–349.

16. Zhan, X.; Stamova, B.; Jin, L. W.; DeCarli, C.; Phinney, B. and Sharp, F. R. Gram-negative bacterial molecules associate with Alzheimer disease pathology. *Neurology.* (2016). 87, 2324–2332.

17. Papamichael, K.X.; Papaioannou, G.; Karga, H.; Roussos, A. and Mantzaris, G.J. *Helicobacter pylori* infection and endocrine disorders: is there a link *World J Gastroenterol.*; (2009). 15:2701–7.

18. Blomstrom, A.; Karlsson, H.; Gardner, R.;

Jorgensen, L.; Magnusson, C. and Dalman, C. Associations between maternal infection during pregnancy, childhood infections, and the risk of subsequent psychotic disorder – a Swedish cohort study of nearly two million individuals. *Schizophr Bull.* (2016). 42:125–133.

19. Takeoka, A.; Tayama, J.; Kobayashi, M.; Sagara, I.; Ogawa, S.; Saigo, T. and Shirabe, S. Psychological effects of *Helicobacter pylori*-associated Atrophic gastritis in patients under 50 years: A cross-sectional study *Helicobacter.*; (2017). e12445.

20. Cheung, S.G.; Goldenthal, A.R.; Uhlemann, A-C.; Mann, J.J.; Miller, J.M. and Sublette, M.E. Systematic Review of Gut Microbiota and Major Depression. *Front. Psychiatry* (2019). 10:34.

21. Agmas, A.; Alemu, G. and Hailu, T. Prevalence of Intestinal Parasites and Associated Factors Among Psychiatric Patients Attending Felege Hiwot Comprehensive Specialized Referral Hospital, Northwest Ethiopia. (2021). 12 51–61.

22. Sunny, G., Sonika, L., Manoj, R., Sanjeet, S., Lalit, K. and Kirti, B. Comparison of Prevalence of Psychological Morbidities, Associated Factors, and Coping Styles between Pre/Para-clinical and Clinical Undergraduate Medical Students: A Rural Institution based Cross-sectional Study in a Northern State of India. *Medical Journal of Babylon* (2022), Volume 19, Issue 2, Pages 191–202.

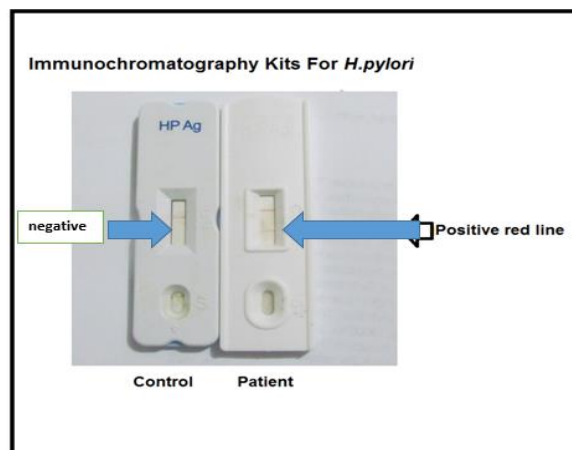


Figure (1): Immunochromatography kit For *H. Pylori*.

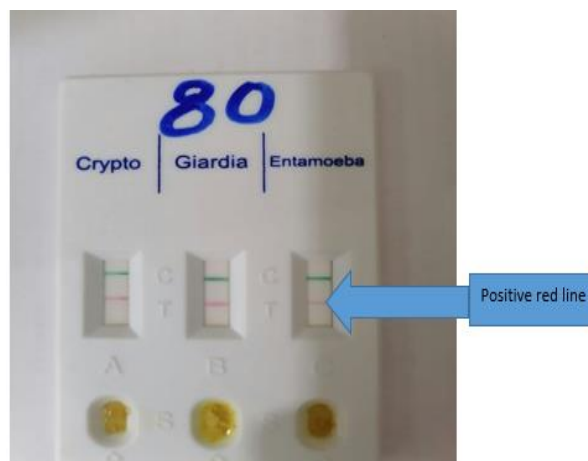


Figure (2): Immunochromatography kit for *Cryptosporidium parvum*, *Giardia lamblia* and *Entamoeba histolytica* in patients.



Figure (3): Immunochromatography kit for *Cryptosporidium parvum*, *Giardia lamblia* and *Entamoeba histolytica* in AHC group.