

Psychological Correlates of Epilepsy

Erum Irshad and Maher Bano
Department of Psychology, University of Peshawar
Peshawar, N.W.F.P., Pakistan.

The main objective of the present research was to investigate the vulnerability of epileptics towards various psychological disorders. It was hypothesized that epileptics are significantly different from non-epileptics in terms of their vulnerability to psychological disorders. The sample included 30 epileptics (i.e. grandmal, myoclonic, primary partial seizures, temporal lobe) from Institute of Neurosciences, Hayat Shaheed Teaching Hospital and Mental Hospital Peshawar and 30 non-epileptics volunteers were selected from the population of Peshawar University. Human Figure Drawing Test (HFDT) and Minnesota Multiphasic Personality Inventory (MMPI-1) were administered individually on each participant. Results indicated significant qualitative and quantitative differences between epileptics and non-epileptics. Epileptics scored higher than non-epileptics on several clinical scales of MMPI: Among epileptics, patients with temporal lobe epilepsy showed higher mean scores on emotional indicators (of HFDT) as compared to other epileptics and non-epileptics suggesting that epileptic group may have more emotional problems. Therefore, it was concluded that epileptic patients were more anxious, aggressive, insecure and on the whole had poor self-concept and more symptoms of depression.

Epilepsy is the common neurological problem, evenly distributed throughout the world. It is estimated that every 200th person (0.5 percent of the population) suffers from epilepsy. Prevalence among children is reported to be higher i.e. roughly every 70th child (1.4 % of all children) is affected (Bett, 2000). Epilepsy has been defined as a recurrent paroxysmal disorder of cerebral function characterized by sudden, brief attacks of altered consciousness, motor activity, sensory phenomena or inappropriate behavior caused by abnormal excessive discharge of cerebral neurons (Dennis, 1991).

The history of epilepsy has close links with psychiatry. Both have links with gods, demons, witches, supernatural and have evoked prejudice, disaffection, and malediction from other members of society. Both illnesses can be found in the earliest of medical writings but further, their symbiotic relationship has been a persistent historical theme. While Greeks referred epilepsy as sacred disease, resulting from the invasion of the body by a god, Hippocrates (460-377 BC) on the contrary declared it a natural affliction with hereditary origin. Hill (1981) reported views of Hippocrates that "Melancholic ordinarily become epileptics, and epileptics melancholic". Historical writings describe association between the moon, epilepsy and insanity. In Rome epilepsy was known as morbidus lunaticus. The

timing of seizures thought to be related to light of the full moon and called lunaticos epileptics by Julius Firmicus Maternus in the fourth century AD (Adams, Klinge & Keiser, 1973). In the later half of 19th century, first neuronal theory of epilepsy defined it as occasional, sudden, excessive, rapid and local discharge of gray matter (Reynolds, 1986).

In electrophysiological study of patients with psychomotor surgeries, scientists were impressed with the association of EEG abnormalities in the anterior temporal area with disturbances in personality, since then the concept has expanded and an enormous, controversial literature has evolved relating temporal lobe epilepsy to personality disorders (Lennox, 1992). Epidemiological study by Pond (1989) has suggested that as many as one-third or more patients with active epilepsy have significantly disabling additional psychological problems, which range from cognitive impairment and behaviour disorders to psychiatric illness of all types, especially depression and anxiety (Hill, 1981).

The nature, scale and complexity of its associated psychological disorders emphasize that epilepsy sits firmly on the bridge or interface between neurology and psychiatry and that the study of these associations can be expected to illuminate other aspects of these two disciplines (Trimble & Reynolds, 1976). It is impossible to identify a single cause of the majority of

cases of epilepsy. These cases are known as idiopathic but about one-third of these cases are symptomatic, suggesting there is a definite etiological factor.

Symptomatic epilepsy could be due to prenatal injury, metabolic defects, malformations and disorders, infections, postnatal trauma, brain tumor and vascular disease. Apart from etiological factors, there are some precipitating factors such as stress or fatigue, illness, flashing lights (photic epilepsy), falling asleep or waking up, physical posture, hyper-ventilation, music and noise, drugs, poisons and alcohol, increase in body fluid, hypoglycemia and alternation, and stoppage or withdrawal of medication.

Classification of Epilepsy

Idiopathic Epilepsy

In idiopathic epilepsy, no specific cause can be found and virtually all patients with this type of epilepsy require anti-convulsant drug therapy.

Symptomatic Epilepsy

Although in symptomatic epilepsy, a primary disease may be recognised, patients may still require anticonvulsant, either because the primary condition is not amenable to therapy or they are waiting for primary therapy such as surgery for a tumour. Each of these two groups can show any of the seizure types: (1) Partial seizures (2) Generalized seizures.

The four major types of epilepsy which are focused in this study are:

1) *Grand Mal*

It is the most dramatic manifestation of the disease and can be very frightening for the onlooker. During the seizures the patient can severely injure himself and at the end of seizure, he may at first glance appear to be dead.

2) *Myoclonic*

Myoclonic-atonic seizures occur mostly between the third and fifth year of life and are a reflection of the developmental stage of the brain. They are associated with severe mental retardation and progressive brain disease.

3) *Partial Epilepsy*

A 'partial elementary' seizure may occur at any age, and the nature of its manifestation depends on the site of the epileptogenic focus in the motosensory cortex of the brain.

4) *Temporal lobe epilepsy*

'Partial complex' seizures arise in the temporal lobe of the brain and since this region has a low epileptic threshold, this type of seizure is relatively common, accounting for about one third of all epileptics. They mainly occur in the first twenty years of life.

Many studies have been carried out on emotional aspects of epilepsy. Zimmerman (1951) carried out a detailed study of 100 epileptic children aged 3 to 16. Epilepsy of symptomatic origin was said to display more "personality deviation" on the Rorschach test than the other cases. Daly (1975) described the psychiatric symptoms of 100 non-institutionalized patients with temporal lobe lesion, and noted 15 with ictal mood changes of whom ten were said to be dysphoric. Williams (1956) studied 100 patients who felt an emotional experience as part of an epileptic attack. The ictal emotions observed were fear, depression, pleasure, displeasure and possibly anger. Glasser (1988) studied psychiatric symptoms in 25 children with psychomotor epilepsy. Nineteen of the 25 children were psychiatrically disturbed and displayed a common picture of excitability, irritability, nervousness, hyperactivity, aggression, temper tantrums, and depression. Gudmundsson (1966) in a survey of Iceland population compared the prevalence rates of psychiatric illness in epileptics and non-epileptics. 25 percent of epileptics showed neurotic symptoms, 50 percent had some type of abnormal personality, and 8 percent were psychotic. In another study by Bell in 2002, who used Middlesex Hospital Questionnaire and Crown-Crisp Experiential Index (CCEI) to assess the phenomenology and frequency of psychopathology in a group of 281 epileptic patients. The epileptic group as a whole was found to have higher anxiety and depression scores than normal control population.

The present research was conducted to investigate the difference between epileptic and matched non-epileptic groups in terms of their vulnerability to various psychological disorders. It also aimed to study the emotional and behavioral correlates of epilepsy.

Hypotheses

1. Participants with epilepsy are more vulnerable to psychological disorders as compared to non-epileptics.
2. Participants with epilepsy show greater number of emotional indicator on HFDT as compared to non-epileptics.
3. Participants with epilepsy will score higher on

MMPI depression scale as compared to non-epileptics.

Method

Sample

The sample consisted of sixty male participants ranging in age from 20 to 45 years (mean age was 32.4 years for both groups). The reason to choose this age range was to reduce the possibility of inclusion of those patients with early development of damage or those having other cognitive deficits. 30 participants were epileptics and 30 non-epileptics. All epileptics were randomly selected through purposive sampling from psychiatry wards of Hayat Shaheed Teaching Hospital, Mental hospital, and Institute of Neurosciences, Peshawar. The epileptic group included patients diagnosed by psychiatrist as suffering from any of the four types of epilepsy (grand mal, myoclonic, primary partial seizures and temporal lobe epilepsy). The duration of their illness was not more than one year and they never received any anti-convulsant medication as yet. They were initially diagnosed using DSM-IV criteria and EEG was performed to confirm the diagnosis. The non-epileptic group consisted of volunteers from the population residing in Peshawar University. The participants were carefully matched with epileptic group on variables of age, education and socio-economic status.

Instruments

1) Semi-structured Interview

Semi structured interview was conducted to gather information regarding family, medical and psychiatric history and mental status examination.

2) Electro-Encephalo Graph (E.E.G)

A simple technique for recording electrical activity of brain was developed in the early 1930's by Hans Berger. EEG's has proved to be a valuable tool for studying such variables as sleep walking, monitoring depth of anaesthesia, diagnosing epilepsy and brain damage. However, EEG measures were used in the present research to diagnose and select epileptic group.

3) Human Figure Drawing Test (HFDT):

HFDT is a test to assess mental maturity based on work of Goodenough (1947) on children's drawings and paintings. It is also widely used as a projective technique to find out underlying psychological process. As a projective technique according to

Sundburg (1961) it is second only to Rorschach in frequency of use in hospitals and clinics in the United States. The drawings are analyzed for sign of unconscious needs, conflicts, and personality traits when used as a projective technique by the clinicians.

4) Minnesota Multiphasic Personality Inventory - 1 (MMPI-1)

It is a self-report inventory designed to provide an objective assessment of some of the major personality characteristics that affect personal and social adjustment. The MMPI has had wide acceptance and is used especially by clinical psychologists (Thorndike & Hagen, 1995). It evaluates in a quantitative form those traits that are commonly considered abnormal. The original test contains 550 statements but its "Urdu translation" (Mirza, 1977) contains 399 items covering a wide range of subject matter. According to the author the total number of items used to obtain three validity scores and nine clinical scales are 399 whereas remaining 156 items are used in secondary scales. Scoring the inventory is purely objective and is carried out by hand scoring keys. In the present research the Urdu version (Mirza, 1977) was used. The Minnesota Multiphasic Personality Inventory items cover areas such as health, psychosomatic symptoms, neurological disorders and motor disturbances, sexual, religious, political, and social attitudes, educational, occupational, family and marital questions, and many well-known neurotic or psychotic symptoms.

5) Diagnostic and Statistical Manual of Mental Disorders (DSM-IV):

DSM-IV was used to confirm the diagnosis of different psychological disorders among epileptic group in two groups and to rule out any disorder in non-epileptic group.

Procedure

The patients were contacted at psychiatry wards of Hayat Shaheed Teaching Hospital, Institute of Neurosciences and Mental hospital, Peshawar. During initial meeting each patient was motivated to participate in the study being conducted through explaining the purpose of the study to them. After getting their consents to participate, they were individually assessed at a disturbance free place inside the hospital. The assessment was carried out in two phases.

Table 1
Prevalence of psychiatric disorders in epileptic group according to DSM-IV criteria

S. No	Grand Mal (n=7)	Myoclonic (n=7)	Primary Partial seizures (n=8)	Temporal (n=8)
1	Obsessive compulsive	Depression	Obsessive compulsive	Depression
2	Anxiety Attacks	Hypochondriasis	Borderline psychosis	Depression
3	Borderline psychosis	Generalized Anxiety	Borderline psychosis	Generalized Anxiety
4		Depression	Depression	
5		Depression	Depression	Psychosis
6				Depression
7				Depression
8				Depression
Total f (%)	3/7 (43)	5/7 (71)	5/8 (71)	7/8 (88)

Phase I

In this phase, each patient was interviewed to collect information regarding demographic variables, such as family, medical and psychiatric history and mental status examination.

Phase II

In this phase, MMPI and Human Figure Drawing Test (HFDT) were administered to each subject with an interval of at least 24 hours, to avoid boredom and fatigue. Similar assessment procedures were adopted with matched group of non-epileptics with the exception of EEG which was initially used to diagnose epilepsy. Psychiatric diagnosis was made using DSM-IV.

Results

Analysis of variance and t-test were applied to analyse data with the help of Statistical Package for Social Sciences (SPSS).

Psychiatric problems were diagnosed with the help of DSM IV. Results in Table 1 reflects that two third (20/30=66.6%) of the epileptic group had some psychiatric illness, half of those had depression. Anxiety and borderline psychosis were the two other types of disorder found in the epileptic group.

To find out vulnerability to emotional problems in two group, t-test was used.

Table 2
t-test analysis of epileptics and non-epileptics on Human Figure Drawing Test (N = 60)

Groups	M	SD	df	t-value
Epileptics	4.16	1.26	58	12.31****
Non-epileptics	.93	.69		

**** = p < .0001

A significant difference between epileptics and non-epileptics was found on HFDT scores as shown in table 2, which shows that epileptics were more vulnerable to emotional problems than non-epileptics.

Table 3

One way analysis of variance for four groups of epileptics on human figures drawing test (emotional indicators).

Source of Variance	df	SS	MS	F
Between Groups	4	160.63	40.16	39.28****
Within Groups	5	56.22	1.02	
Total	59	216.85	41.17	

**** = p < .0001

Table 3 shows result of one way of analysis of variance that reveals a significant difference among 4 epileptic groups, regarding emotional indicators measured through HFDT.

Table 4

Number of emotional indicators of four group of epileptics on human figures drawing test.

No of cases	GM	M	PPS	TL
(n=30)	(n=7)	(n=7)	(n=8)	(n=8)
1	8	2	5	3
2	4	4	3	4
3	3	4	5	4
4	5	3	3	4
5	5	6	5	4
6	3	5	3	4
7	5	4	4	8
8	-	-	2	7
Total	33	28	30	38
Means	4.71	4.0	3.75	4.75

Note: GM = Grand mal, M = Myoclonic, PPS = Primary Partial seizures, T = Temporal Lobe

Table 4 shows that those with temporal lobe epilepsy and grand mal epilepsy have slightly higher mean scores on emotional indicators, which suggests that these groups may have more emotional problems as compared to other three groups.

The detailed analysis of 27 emotional indicators of HFDT for epileptics and non-epileptics are displayed in table 5.

It can be clearly seen that epileptics consistently got higher scores as compared to non-epileptics on majority of HFDT expressed emotional indicators. Moreover, 6 indicators (number, 1, 3, 10, 16, 22 and 23) were present in almost two-third of the epileptics.

Greater number of emotional indicators on HFDT shown by epileptics as compared to non-epileptics, indicate that epileptics have poor self-concept, feelings of insecurity and depression. They appear to be immature, impulsive, aggressive and emotionally disturbed. Whereas collective scores of non-epileptics showed less number of emotional indicators showing good self-image and emotionally mature and balanced personalities.

Table 5

Number of expressed emotional indicators through Human Figure Drawing Test by epileptics (n = 30) and non-epileptics (n = 30).

Sr.No	Emotional indicators	E	NE
1	Poor integration of parts	17	1
2	Shading of face	5	0
3	Shading of body or limbs	10	3
4	Shading of hands or neck	3	1
5	Gross Asymmetry of limbs	3	0
6	Slanting figure	3	0
7	Big figure	3	5
8	Transparencies	2	0
9	Crossed eyes, turned in or out	1	0
10	Teeth	1	0
11	Short arms	11	6
12	Long arms	2	0
13	Arms clinging to sides of body	2	5
14	Hands cut off or without figures	3	0
15	Legs pressed together	0	5
16	Monster or grotesque figure	11	0
17	No eyes	1	0
18	No body	5	0
19	No arms	1	0
20	No legs	1	0
21	No feet	3	0
22	No neck	13	0
23	Vacant eyes	14	2
24	Broken lines	8	4
25	Side way glance	4	0
26	Hidden hands	1	1
27	Big head	0	1
	Total	126	34

Note: E = epileptics, NE = non-epileptics

Table 6

t-test analysis of epileptics (n=30) and non-epileptics (n=30) on Depression scale of MMPI.

Groups	M	SD	df	t-value
Epileptics	34.30	6.21	58	9.04***
Non-epileptics	19.53	6.45		

*** = p < .001

t-test analysis was carried out to see the difference between epileptics and non-epileptic groups. Table 6 shows that there is a significant difference between depression scores of epileptics and non-epileptics.

Table 7

Mean, SD, and t test results for epileptics (n = 30) and non-epileptics (n = 30) on different scales of MMPI. (df = 58).

Variable	Epileptic		Non-Epileptic		t-value	Sig
	Mean	SD	Mean	SD		
Hs	30.80	7.04	14.23	5.74	9.98	.001
D	34.30	6.21	19.53	6.44	9.04	.0001
Hy	25.13	4.15	19.80	5.04	4.47	.0001
Pd	7.60	8.52	8.30	9.22	0.50	.62
Mf	13.93	10.27	12.50	11.93	0.50	.62
Pa	20.40	6.40	13.36	4.56	4.90	.0001
Pt	21.23	7.91	17.03	8.28	2.01	.049
Sc	36.63	5.05	27.70	4.51	57.27	.001
Ma	26.43	10.33	21.10	6.53	2.39	.02
Si	41.10	7.70	26.53	11.19	5.87	.0001

Epileptics reported higher depression than non-epileptics on MMPI depression scale.

Further analyses were carried out on each MMPI sub-scale. t-test analyses were conducted separately to see the difference between epileptics and non-epileptics. Table 7 shows that epileptics scored significantly higher than non-epileptics on all MMPI scales except on Mf and Pd scales.

Discussion

The findings of present research clearly differentiated between epileptics and non-epileptics in terms of their vulnerability to psychological disorders. Thus first hypothesis that epileptics are more vulnerable to psychological disorders was supported. Among thirty epileptics, two third were diagnosed as suffering from different psychological disorders, which include psychosis, depression, generalized anxiety, obsessive compulsive disorder, hypochondriasis and general symptoms of anxiety. The results support the findings of Pond & Bidwell (1989) who suggested that as many as one third or more patients with active epilepsy have significantly disabling additional psychological problems ranging from the cognitive impairment and behavioural disorders to psychiatric illnesses of all types, especially depression and anxiety.

Among epileptics, majority with temporal lobe

epilepsy were found to be suffering from depression in the present study. The results are in line with the study carried out by Rutter, Graham and Valne (1995) who also reported a high incidence of depressive illness in temporal lobe epileptics. David (1997) in his study also found that depression occurred more frequently in patients with temporal lobe epilepsy than in patients with generalized epilepsy, affecting more than one in five temporal lobe epileptics. It may be due to the fact that temporal lobe is related to the limbic system, which is the anatomical substrate of emotions comprised of Hippocampus and Amygdala occupying a central position in the regulation of emotional expression. Therefore, psychological symptoms frequently occur with seizures arising in the medial temporal lobe.

Results of the present study indicate that epileptics are prone to depression or depressive feelings because personality difficulties acquired by having epilepsy, especially dependency, general lack of social skills and low self-esteem, combined with parental over protectiveness and prejudice, may cause problems in finding friends and work. This, in turn may lead to social isolation, feelings of rejection, frustration and dependency. Small (1972) also found that temporal lobe epileptics would display more psychopathology than patients with other kinds of epilepsy.

Greater number of emotional indicators on HFDT were shown by epileptics as compared to non-

epileptics, which confirmed the second hypothesis indicating that epileptics have poor self-concept, feelings of insecurity and depression. They appear to be immature, impulsive, aggressive and emotionally disturbed. Whereas collective scores of non-epileptics showed less number of emotional indicators showing good self-image and emotionally mature and balanced personalities. Within epileptic group, those with temporal lobe epilepsy showed high mean score on HFDT as compared to other groups of epileptics indicating greater personality changes than those with temporal lobe epilepsy. These findings are in line with what was found by Berent (1992) in his study that temporal lobe epileptics complained of more irritability, impaired concentration and severe depression. Nuffield (1995) also demonstrated in his study that temporal lobe epileptics had high aggression and low neuroticism rating while those with generalized seizures showed the reverse trend i.e. low aggression and high neuroticism ratings.

The detail interpretation of responses of temporal lobe epileptics on HFDT revealed that temporal lobe epileptics have very poor self-concept, low self-esteem, and unstable personalities. They appeared to be aggressive, impulsive, immature, insecure, fearful, stubborn, negative minded and perceive themselves as ridiculous individuals who are not fully accepted by others. The findings of this study strongly support the third hypothesis i.e. patients suffering from temporal lobe epilepsy will show greater changes in personality (i.e. ego-centricity low self-esteem, proneness to aggressive outbursts) as compared to patients having other kinds of epilepsy.

On the other hand, results indicated that the most dominant and recurrent features of epileptic group on the whole were aggression, immaturity and poorly integrated personalities. They also appeared to be anxious about their bodily functions, egocentric, dependent, depressed and had vague perception of the world which result in difficulty in reaching out to the world and toward others.

Significantly higher mean score of epileptics as compared to non-epileptics show that they have relatively high risk to develop psychological disorders which is also in line with their diagnoses based on case history information. Epileptics high score on depression scale of MMPI-1 as compared to non-epileptics, confirmed our fourth hypothesis, i.e. epileptics will score higher on depression scale of MMPI-1 as compared to non-epileptics.

Scores of participants on six clinical scales of MMPI-1 also reflect significant differences in personality characteristics of epileptics and non-

epileptics. High scores of epileptics on these scales suggests that they are concerned about their health, are prone to worry and are more emotional, sentimental, dissatisfied, aloof, apathic, cautious and withdrawn. They are suspicious and sensitive about others perception about themselves. A possible reason of this may be the fact that epilepsy is considered a stigma in our society. As a result, epileptics develop feeling of insecurity, worry and suspiciousness. The high scores of epileptics on paranoia scale suggested that epileptics were prone to worry, sensitive, emotional and readily becoming ego involved in various activities. In contrast, the low scores on paranoia scale of non-epileptics suggest the balance in personality and decisiveness.

The high scores of epileptics on Sc scale suggested that epileptics were emotionally disarticulated, irritable, resentful, aggressive, stubborn and sentimental. Low scores of non-epileptics on this scale characterized them as cautious, conventional, responsible and self-controlled.

The social introversion scale (Si) measures the tendency to withdraw from social contact with others. High scores of epileptics show that they are slow, stereotyped, lacking originality in approach to problems. They are rigid in thoughts and action, overly controlled inhibited and lack confidence in their own abilities. Low scores of non-epileptic suggest that they are sociable, versatile, talkative, assertive and adventurous.

A comparison of MMPI profiles of epileptics and non-epileptics revealed that epileptics were more vulnerable to develop psychological problems, especially depression. These results are also supported by other studies measuring psychological profiles of epileptics on different scales i.e. Rorschach Inkblot test, Crown's Word Ranking Test and Maudsley Personality Inventory (Zimmerman, 1951).

All these personality changes may be inevitable because of the nature of the disease. Being subject to unnecessary stigmatization and labeling, enhances their disability in society related to the prejudice about this disorder. Moreover, when a physician communicates the diagnosis of epilepsy to the patient, people quickly learn to see the status of epileptic as a social and personal liability. This special view of the world predisposes individuals to conceal their condition and its medical label from others. Unlike physical handicaps that are always visible, epilepsy evokes little support from the community. People with epilepsy are particularly stigmatized group. The seizures speak up unannounced in a dramatic manner and cares not for social etiquette. The fear of loss of

control in public sets in motion defensive maneuvers of secrecy and withdrawal. These are particularly marked if the individual has been sensitized by prior ridicule and rejection from his peer group. Such defenses may initially protect an already fragile self-esteem, but in longer term socially isolate the individual. This condition is further intensified by the attitude of the family. Within the family, the function of the epileptic individual can become restricted. In response to the unpredictability of epilepsy, families tend to adopt a rigid, autocratic attitude. As a result, the young person with epilepsy is excluded from active participation in this process and may withdraw entirely from family interaction, which results in the development of different psychological complications. The present research indicated that epileptics are more likely to develop psychological disorders as compared to non-epileptics. Among epileptics two third were diagnosed as suffering from different kinds of psychological disorders while remaining one third showed general symptoms of anxiety whereas there were no signs of psychopathology in non-epileptics. These findings were also supported by analysis of Human figure drawing test and MMPI scores.

References

- Adams, K., Klinge, V., & Keiser, T. W. (1973). The extinction of a self-injurious behavior in an epileptic child. *Behaviour Research and Therapy*, 11, 351-356.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders*. (4th ed.). Washington DC: Author.
- Berent, S. (1992). *Psychological disturbance in epilepsy*. USA: Butterworth & Heinemann p.p. (13-109).
- Bett, D. (2000). *Prevalence and incidence of epilepsy among adults*. New York: Raven press.
- Daly, D. (1975). Ictal manifestations of complex partial seizures. In J. Penry, & D. Daly, (Eds.). *Complex partial seizures and their treatment. Advances in Neurology*. New York: Raven Press.
- David, A. (1997). Anxiety, depression and temporal lobe epilepsy. *Journal of Neurology*, 20, 24.
- Dennis. (1991). *Neurobehavioral problems in epilepsy*. New York: Raven Press.
- Gibbs, F. A. (1948). *Ictal and non-ictal psychiatric disorders in temporal lobe epilepsy*. New York: Raven Press.
- Glasser. (1988). *Anti epileptic drug: Mechanism of action advances in neurology*. New York: Raven press.
- Goodenough. (1947). In Koppitz. *Psychological evaluation of children's drawings*. New York: Grune & Stratton.
- Gudmundesson, D. (1966). Epilepsy in Iceland. *Acta Neurologica Scandinavica*, 43 (Supplement 25), 128.
- Hill, D. (1981). Historical review. In E. H Reynolds. & M. R. Trimble (Eds.). *Epilepsy and Psychiatry*. London: Churchill Livingstone.
- Lennox, W. G. (1960). *Epilepsy and related disorders*. London: Churchill, Livingstone.
- Lennox, W. G. (1992). Brain injury, drugs and environment as causes of mental decay in epilepsy. *American Journal of Psychiatry*, 99, 174-180.
- Mirza, L. (1977). *Minnesota multiphasic personality inventory (MMPI)*. Unpublished manual, Lahore, Pakistan.
- Nuffield, E. J. A. (1995). Neurophysiology and behaviour disorders in epileptic children. *Journal of Mental Science*, 107, 438-458.
- Pond, D. (1989). Psychiatric aspects of epileptic and brain damaged children. *British Journal of Medicine*, 2, 1377-1382.
- Pond, D. A., & Bidwell, B. H. (1989). A survey of epilepsy in fourteen general practices: Social and psychological aspects. *Epilepsia*. New York: Raven press.
- Reynolds, E. H. (1986). Anticonvulsant drugs float metabolism and mental symptoms. In proceedings of *XII Epilepsy International Symposium*. New York: Churchill.
- Rutter, M., Graham, P., & Valne, W. A. (1995). A neuropsychiatric study in childhood. *Clinical Development Medicine*, Vol.35. London: Heinemann.

Small, J. G. (1972). A control study of mental disorder associated with epilepsy: Recent Advances in Biological Psychiatry. *Archives of Neurology*, 7, 187-194.

Sundberg, E. (1961). In E. koppitz. *psychological evaluations of children drawings*. New York: Grune and Stratton.

Thorndike, R. L. & Hagen, E. P. (1995). *Measurement and evaluation in psychology and education* (4th ed.). New York: MacMillan.

Trimble, M. R., & Reynolds, E. H. (1976). Anticonvulsant drugs and cognitive functions: A review of literature. *Epilepsia*, 28, 37-45.

Trimble, M. R. (1989). Anticonvulsant drugs: Mood and cognitive function. In M. R. Trimble; E. H. Reynolds (eds.) *Epilepsy, Behaviour, and Cognitive Function*. (P. 135-143). UK: John Wiley. .

Williams, D. O. (1956). The structure of emotions reflected in epileptic experiences. *Brain*, 79, 29-67.

Zimmerman, F. T. (1951). Use of methylphenylsuccinimide in treatment of petit mal epilepsy. *Archives of Neural Psychiatry*, 66, 156-162.