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Review Article

Work-Related Injuries Among Epileptic Employees: A Scoping Review

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Abstract

Background: Epilepsy is a non-communicable common neurological defect that can affect individuals of all ages. Working is essential for epileptic individuals; however, it can also be dangerous if proper measures are not put in place to minimize the risks of injury. It helps individuals become independent and contribute to society and can assist in improving the lives and self-worth of epileptic individuals. The study aims to know the linkage between epilepsy and injury at the workplace and its risk factors if it influences epileptic patients' lives. Moreover, types of epilepsy have the majority causing injury among employees. Our objective is to identify the relationship between epilepsy and injuries at the workplace, investigate the quality of life among them to ascertain the impact and risk factors that epilepsy caused, and identify which type of seizure is at higher risk of injury among employees.

Method: According to the Arksey and O'Malley framework**,** we searched PubMed, Summon, and Ovid databases for English full-text articles published between 2005 and 2022 using search terms' epilepsy' and 'injury' and 'employee' in the title.

Results: Our study contains eight articles included in our review as they meet the criteria; four focus on epilepsy and injury, and the other focus on epilepsy and the workplace.

Conclusion: People with epilepsy (PWE) has a higher unemployment rate because of the incidence of accidents at the workplace. Fear of having seizures during work time which is a significant effect on epileptic individuals' work state. Employers and Co-employers at the workplace have a negative attitude toward epilepsy, which further isolates PWE. Some injuries and ignorance to deal with it can prevent the patient from having a normal life.

***Keywords:** Epilepsy, injury, work, employee*

1. Introduction

Seizures occur when there is unusual electrical activity in the brain that results in abnormal body movement, sensation, behavior, or function. At the same time, epilepsy is a medical condition characterized by recurrent seizures (Employment Opportunity Commission. 2013). Seizures variate in duration according to the type. Epilepsy affects people of all ages (Employment Opportunity Commission. 2013); after headaches, it is the most frequent neurological defect in Saudi Arabia and is expected to have a significant impact of 6.54 in line with 1000 individuals (Saleh *et al.*, 2021).

However, in about half of the cases worldwide, the causes of the disorder are not known. In the other half of the patients, the reasons can be divided into three categories, which include infectious, immune, and genetic causes (Anon, 2022. Epilepsy. World Health Organization.).

Symptoms of epilepsy include involuntary movement, muscle contraction, confusion, staring, and loss of consciousness. Epilepsy is often related to stigma and practical disability. As a result, people with epilepsy regularly have socioeconomic problems such as marriage, educational fulfillment, and employment demands situations in their lives (Asadi-pooya *et al.*, 2020).

Overall, accidental injury can be seen in people with epilepsy (PWE) than in normal people (Cornaggia *et al.*, 2006). Epilepsy can limit an individual's life because it reduces the quality of life and increases the risks of workplace accidents due to sudden episodes of seizures. The risk of accidents is two times higher for epileptic individuals than for non-epileptic (Jacoby *et al.*,2005). There is socio-economic variability in epileptic patients against the overall population.

The most common unemployment reason in epileptic patients is fear of seizure occurrence during work time (Asadi-pooya *et al.*,2020). The work managers may lack of knowledge about epilepsy and may express an anxious attitude while dealing with epileptic employees at the workplace (Baillie, 2011). Caring for epileptic patients can be costly for individuals, their families, and employers. Some of the costs related to epilepsy include loss of work productivity among epileptic employees and liability insurance costs for employers. (Jacoby *et al.*,2005).

Furthermore, the cost of medication (Employment Opportunity Commission. 2013). Epilepsy-related injuries are accompanied by medical costs, increased stress, and disruption (Jacoby *et al.*,2005). Proper management of epileptic employees and improving the working environment to support their work can reduce the direct and indirect costs associated with epilepsy. Understanding the types of seizures that an epileptic employee experience is essential because the employer can use this information to ensure that the employee is given responsibilities that do not expose them and their co-workers to increased risks of injury.

We did this scoping analysis to identify the available literature gaps since few research studies have studied epilepsy associated with workplace accidents. The following were the study's current goals:

(1) To identify the relationship between epilepsy and injuries at the workplace.

(2) To investigate the quality of life among them to ascertain the impact and risk factors that epilepsy caused.

(3) To identify which type of seizure is at higher risk of injury among employees.

2. Methods

2.1 Scoping review

The purpose of this scoping review was to see how epilepsy affected employee injuries. Our strategy followed the five-step Arksey and O'Malley framework: Identifying the research question, identifying relevant studies, study selection, charting the data, collating, summarizing, and reporting results.

2.2 Identifying the research question:

The focus of our review was to identify if there is a relation between injury and epilepsy in employees. To ensure that there is sufficient literature related to our topic, we posed the initial question to lead the research: Is there a relation between injuries at the workplace and epilepsy? What is the psychological impact for epileptic employees while at work? What kind of injuries happen at the workplace involving epileptic employees?

2.3 Identifying relevant studies:

The data collected in this study involved searching in different databases, including PubMed, Summon, and Ovid, with the words 'epilepsy ' and 'injury' and 'employee.' Most were written and published in English between 2005 to 2022. We read each article and ensure that they contain information about epilepsy-related injuries at the workplace.

We included English articles, full text, and those published from 2005 to 2022. We excluded articles from other languages, systemic reviews, pediatric articles, and those unrelated to the employee. Furthermore, those who did not answer our research question were excluded.

2.4 Study selection

The researcher considered different articles to determine their relevance and eligibility for inclusion. The researcher assumed the title and the abstract of the article to decide whether it had relevant information on injuries among epileptic employees in the workplace. If the abstract was relevant, the entire article was analyzed to determine how it contributes to the current research.

By the initial search, we found 726 relevant articles. Out of these, 295 through PubMed, 272 through Summon, and 159 through Ovid were published between 2005 and 2022. We excluded 17 duplicate articles in PubMed, Summon, and Ovid. After further research, we made inclusion and exclusion criteria that summed up 8 articles we considered to reference our study.

2.5 Summarizing and reporting the results:

The articles selected were charted using Arksey and O'Malley's framework. The author, title, year, study design, study location, sample size, and outcomes of the articles were all summarized. The details of the chart are listed in (figure 1).

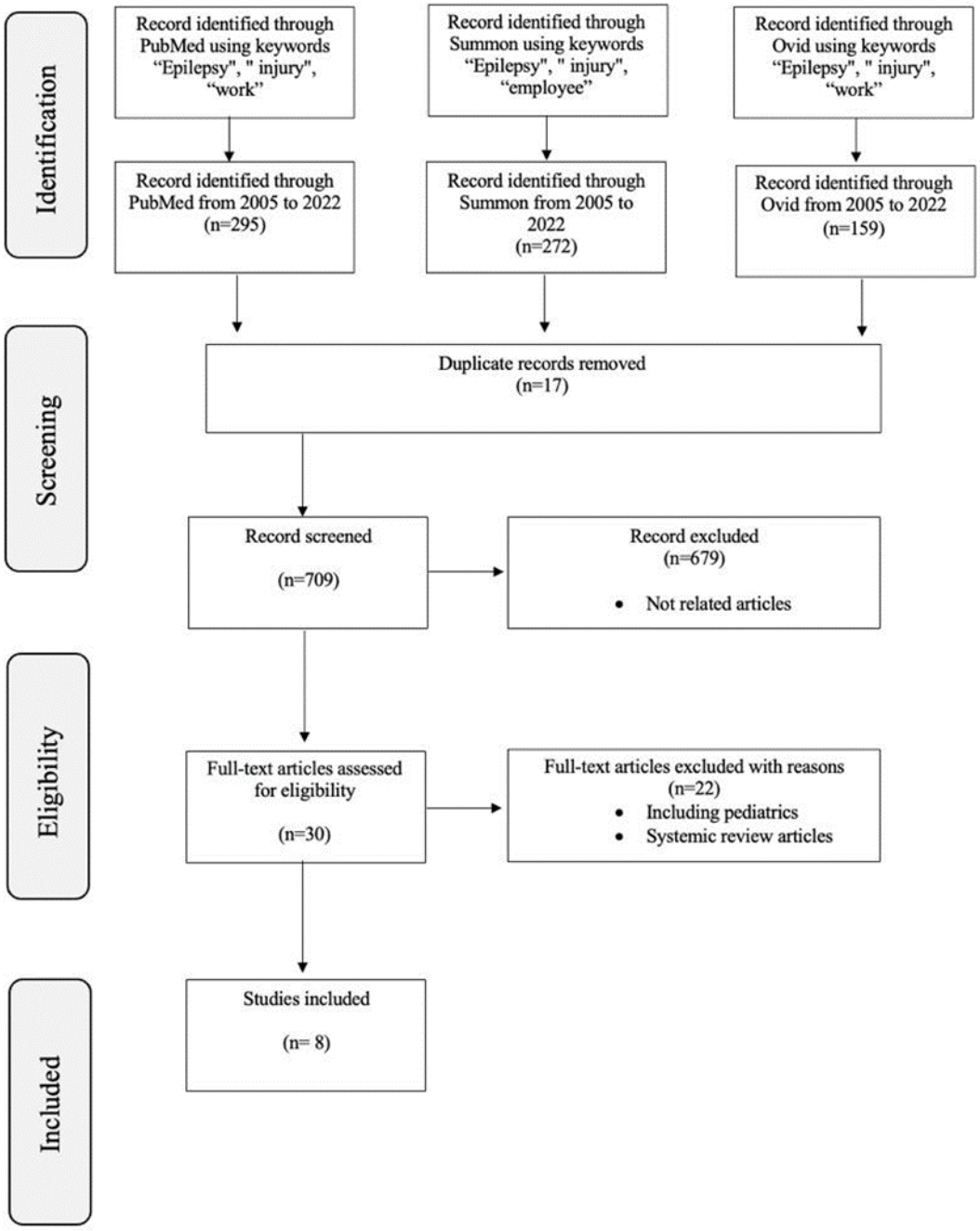

Figure 1. *Screening article flowchart.*

3. Results

3.1 Included studies:

In our study, we used PubMed, Summon, and Ovid as searching engines using the following keywords “epilepsy, "injury", "employee", and "work". The filters used are the years between 2005 to 2022. We found 292, 272, and 159, respectively. The duplicated records were 17, and all of them were removed. After the screening, the total number of articles was 709. We excluded 679 articles that are not related to our topic. The remaining 22 articles were excluded because they included pediatric and systematic review articles.

3.2 Study characteristics

Our study contains eight article's summaries with inclusion and exclusion criteria from 7 countries (2 from the UK, one from Brazil, one from Malaysia, one from Japan, one from Europe, one from Saudi Arabia, and one from Iran). Based on the study designs, there were four cross-sectional studies, two prospective studies, one case-control study, one retrospective study, and one national statistics study. We divided our articles into two groups: four studies for epilepsy and employees and four studies for epilepsy and accidental injuries.

3.3 Epilepsy and employees

We divided our articles into two groups; four studies (50%) discussed epilepsy and employee, whereas Jacoby *et al.* (2005) found that epilepsy threatens employment prospects. Individuals with epilepsy are two times at risk of unemployment than individuals without epilepsy. Employers are hesitant to hire epileptic individuals because they do not understand the nature of epilepsy but they can improve the working environment to accommodate epileptic individuals.

According to Lim et al. (2013), there are social (Marital status, employment status, and monthly income) and clinical factors (Age of seizure onset, frequency per year, and freedom for one year) associated with unemployment among epileptic individuals, few of them who get employment are usually in part-time or low-income employment.

Asadi-Pooya *et al.* (2020) reported that 37 patients (53%) out of 70 were unemployed. The common reason is a functional impairment (e.g., inability to work), stigmatization, racialism, and uncontrollable seizures. Some people with epilepsy experience anxiety due to the fear of having seizures at work or in public.

Saleh et al. (2021) studied 540 patients showed that 44% were unemployed, and 15% disclosed that they quit their job because of seizures. The common cause of unemployment is the patient’s concern about having seizures. In addition, the result reported that the most common type of seizures among epileptic patients at work is generalized or complex focal seizures. In general, Individuals with epilepsy have an increment of unemployment risk.

3.4 Epilepsy and accident injury

The other group contains four studies that discussed epilepsy and accident injuries (50%). Cornaggia et al. (2006) found that individuals with epilepsy and other underlying conditions are at a higher risk of severe and more frequent seizures while at work. Three hundred forty-two cases (54.2%) were employed at the time of enrolment. Some factors could affect the injury, such as the circumstances, consequences, and type. Most injuries were not severe; one case needed hospitalization, and 12 cases required days off. Partial epilepsy is the most common epileptic syndrome, followed by generalized epilepsy and then undetermined epilepsy tonic-clonic seizures. Most PWE had no or rare episodes, while 13% were related to the injury.

Lunardi et al. (2010) mentioned that epilepsy was in charge of the high number of accidents related to work. The total was 858 records over ten years between 1999 and 2008. The total typical with WAC "Workplace Accident Communication" is 459, the route with WAC is 103, occupational disease is 103, and without WAC 193.

Palmer et al. (2014) suggested that employers should develop necessary measures to minimize the risks of accidents as recommended by healthcare practitioners. Some of the epilepsy-related injuries in the workplace include submersion in hot oil or water, leading to burns and head trauma; the most common injuries include motor vehicles, concussions, fractures, and dislocations.

Nishida et al. (2020) showed 172 responses. The chance of having accidental injuries in PWE was 1%. The seizures caused accidental injuries characterized by inappropriate behavior and fall with impairment of awareness. The types of injuries reported are fracture, burn, and laceration. There was one-fourth of PWE resigned from their jobs due to epilepsy. About fourth-fifth reported having seizures at their workplace, which interfered with their task.

Table: 2

	Title	Authors	Year	Location	Objective	Study design and number of patients	Outcome
1	Employers' Attitudes to Employment of People with Epilepsy: Still the same old story?	Ann Jacoby, Joanne Gorry, Gus A Baker	2005	UK	One area of life quality known to be compromised by having epilepsy is employment; Employer attitudes are one factor contributing to the employment challenges of people with epilepsy (PWE).	Cross-sectional study. N=560	The response rate was 41% (n=204).26% have Companies experience employing 14 UK PWE. 16% economic considered that regions. Mail their **companies.** survey had no jobs suitable for epileptic people. 21% felt that it was a "major issue" employing PWE.
2	Accidents at work among people with epilepsy Results of a European prospective cohort study	Cesare Maria Cornaggia, Massimiliano Beghi, Luca Moltrasio, Ettore Beghi	2006	Europe	To investigate the incidence and characteristics of accidents at work in a group of epileptic patients and a group of non-epileptic controls.	Prospective cohort study. N= 631	One patient had six accidents, four patients had two accidents, and two controls had three and two accidents.
3	Epilepsy and occupational accidents in Brazil	Mariana dos Santos Lunardi, Lucas Alexandre Pedrollo Soliman, Carla Pauli, Katia Lin	2010	Brazil	The aim of this study is to analyze the implantation WRA patterns and the Epidemiologic and Technical Security System Nexus (ETSSN) among epilepsy patients (PWE).	National statistic study. N= 858	The total number of epilepsies related to accidental injuries between 1999 to 2008 in Brazil Was 858.
4	Impact of epilepsy on employment in Malaysia	Kheng Seang Lim, Su Woan Wo, Mee Hoo Wong,	2013	Malaysia	To find out how epilepsy affects work in Malaysia.	Cross-sectional and prospective study.	74 of the participants (69.6%) were full-time employees, 26 (10.4%) were part-time employees, and 50 (20%) were unemployed.
5	Epilepsy, diabetes mellitus and accidental injury at work	K. T. Palmer, S. D'Angelo E. C. Harris, C. Linaker	2014	UK	To evaluate the role of epilepsy and diabetes in occupational injury.	Case-control study N=160	A total of 160 subjects (2%) had previous epilepsy, including 29 injury cases.
6	Seizures, accidental injuries at work, and reasons for resignation in people with epilepsy	Takuji Nishida, Kiyohito Terada, Hitoshi Ikeda, Yushi Inoue	2020	Japan	To determine the risk of workplace injury, its relationship to various seizure features, and the reasons for resignation.	Retrospective study. N= 172	At work, 41.2% of people had seizures. Seizures at work had caused 54.8% of respondents in absent from work. (38.7%) of 62 patients said their seizures at work had interfered with their coworkers' responsibilities. Seizures have forced 20 (32.3%) of the 62 patients to change their jobs. 16% of patients are concerned about having a seizure at work.
7	Education, marriage, and employment in people with epilepsy: the barriers that patients perceive.	Ali A. Asadi, Pooya, Maryam Homayoun, Shahla, Keshavarz	2020	Iran	The aim is tried to investigate their reasons for social underachievement and challenges, as well as their perspectives of those factors.	Cross-sectional study. N=70	16% of patients fear having seizures at work.
8	Employment and occupational safety among patients with seizure disorders – findings from a tertiary hospital in Saudi Arabia	Rana A. Saleh, Maha Aleid, Raneem Saleh, Abdulaziz Al Semari, Nujud Alrushud, Reem BinJaber, Ghada Alammar, Atheer Aldoss, Amal Abujaber, Hala Khalil	2021	Saudi Arabia	To evaluate characteristics linked with unemployment and describe the work situation of people with seizure disorders.	Cross-sectional study. N= 540	44% were unemployed, 64% were females, and 27% were male. 15% were previously employed.

4. Discussion

Epilepsy is a common non-communicable neurological disorder characterized by recurrent seizures. The main findings of our scoping review were divided into two groups; one of them discussed epilepsy and accidental injuries and found that individuals may be injured at the workplace due to the inability to control their body and lack of awareness of what is happening in the environment.

The other discussed epilepsy and employees and showed that most PWE is unemployed due to stigma and negative attitude toward them from employers and co-employers. The working environment can be improved to ensure safety for employees living with epilepsy. Making different working environments safer is possible by just making some changes. In most cases, organizations change the working environment provided by government guidelines.

4.1 Epilepsy and employees

According to Jacoby *et al.* (2005), PWE may be at a disadvantage in employment due to three different aspects of epilepsy: the hazardous nature of some jobs or the behavioral and mental impairments sometimes associated with epilepsy.

This study discusses that the attitudes of employers and coworkers may affect many patients with epilepsy and play a significant role in determining their employment status and career advancement. However, the study contains one of the most significant reported literatures. Nevertheless, there is a low response rate, and they had no control over who responded to the questionnaire and if the answers were truthful.

Lim et al. (2013) pointed out that in Malaysia, PWE unemployment is considered a number within general unemployment (for other reasons). Epileptic people are unusual to work part-time even though if they work, their income is too low (below the poverty line) in comparison with their fellows. It is affected by such factors and challenges: as education, frequent seizures, socioeconomic and marital status, which becomes a chain consequence of no education lead in relation to employment and marriage.

However, we see that people with frequent seizures could be employed with a good outcome and improving psychological aspects. The severity of the seizures is the highest detriment to employment more than frequency; a study showed that onset age is an enormous effect on employers to choose people who have had seizures since childhood, have adapted to the situation, and can improve skills in dealing with it, less self-harm, and self-directness in contrast adults are less persisted to stay in a job due to more minor personal traits and control.

On the other hand, sociocultural factors play an essential role in Asia more than clinical factors, but it is not assessed in this study. Also, Psychological aspects are linked to employment, but they are not assessed here. The cohort is predicted to be of lower socioeconomic status than the general epilepsy community. However, the cohort's heterogeneity makes comparisons between groups with different medical and demographic features possible.

Asadi-Pooya *et al.* (2020) reported that the common reason for the uneducated level of young individuals with epilepsy is the fear of having seizures in public places such as schools. And as fear prevents education, it also has a significant role in affecting the work state in PWE; uncontrolled seizures are considered a clinical factor affecting the unemployment state. There is also apparent stigmatization resulting in unmarried. In these cases, PWE may get an advantage from vocational rehabilitation to improve the quality of their life. Various strategies may aid people with disabilities in overcoming the stigma and discrimination imposed on them because of their medical condition. Rehabilitation services may be beneficial to the unemployed who perceive that they cannot work. Creating support networks and increasing public knowledge are two essential strategies for reducing stigma and discrimination against PWE.

Saleh et al. (2021) found that the participants who primarily experienced seizures during sleep were more likely to be employed. However, no significant relationship was found between seizure characteristics and employment status; other factors associated with employment status and other factors related to employment were gender, age group, and the highest educational level of patients following traumatic brain injury; those who developed seizures were significantly less likely to be employed. The sample had lower education levels than other studies—also, there is insufficiency in choosing the age groups. There were only 13 patients aged 60 years or older. However, this is the first study in Saudi Arabia that concentrates on the disease's social dimension.

4.2 Epilepsy and accidental injury

According to Cornaggia et al. (2006), the rate of employment in PWE is the same of general people, and their work outcome is never less than other people. Employability found no relation between seizures in the workflow situation or reasonable control and management of seizures. Still, there are apparent factors that can alter the employee's function, such as: increasing the rate of seizures, neurological, psychological problems, level of danger, and absenteeism.

The association between injury was two times in PWE more than in ordinary people. It was mild or unrelated to seizures even in people with idiopathic symptomatic seizures. These results were social implications that focus on stigmatization. People with epilepsy believe they have been treated unfairly in getting a job. Nevertheless, people with epilepsy face stigma and isolation due to this study, which has significant social implications.

Furthermore, there is an inability to find specific job categories and disease characteristics for epilepsy patients may result from the study's small sample size.

Lunardi et al. (2010) reported that people with epilepsy could work if their occupation is appropriate and not expose them to dangerous situations. However, professional competence, higher degrees of education, proper seizure control, and treatment of mental comorbidities would lower the number of WRA and increase their participation and return to the official job market. Educational and vocational strategies should encourage PWE to develop professional skills. When welfare payments are terminated, and vocational rehabilitation is required, the patient is encouraged to engage in professional activity and reintegrate into society. The statistics used do not distinguish between professions, gender, or specific conditions. In addition, no statistics are available about the number of PWE in employment and how many work informally.

Palmer et al. (2014) study was reassuring to many people because no studies, including those concentrating on more severe seizures, identified a statistically significant increase in risk. The chances of injuries at the workplace in epileptic individuals are likely to be reduced by selective exclusion from certain study types of work. Still, most workplaces do not put workers with this disorder type at injury risk.

Furthermore, the twenty-two occupational injuries in epilepsy patients and nine in controls mainly consisted of contusions and minor burns, wounds, hematoma, and abrasions; only two were counted as seizure-related, both minor. At the same time, this study used a database that included a huge sample of patients with occupational injuries. However, the database only recorded injuries if present in medical care and not those who had a self-treated injury. Also, this study did not mention all injury cases within the system.

Nishida et al. (2020) said seizures that cause injuries and restrict individuals' tasks have specific characteristics such as falling, inappropriate behavior, and loss of awareness. Still, it is not a definite cause of injury. However, work managers must be well educated about seizure characteristics and frequency and how to deal with epileptic individuals at the workplace. Injuries like fractures, burns, laceration, abrasion, and submersion were also documented in the study. Most of them were minor and did not necessitate hospitalization. Patients who work in jobs requiring physical activities have a higher rate of accidental injuries at the workplace. Nevertheless, the study is based on self-reporting, and there is also a possible selection bias as the data was collected from a single epilepsy center.

4.3 Workplace accommodation

According to **Baillie (2011),** about 30 percent of epileptic individuals are in full employment, and 17 percent are in part-time employment. Individuals with epilepsy find it challenging to find and keep a job compared to people without epilepsy. This guideline concern two laws, workplace, and discrimination laws, that present the rights of epileptic employees and the responsibilities of employers.

The workplace law:

The term "workplace law" refers to a broader category of laws that govern workplace behavior in this guide. It mainly affects those currently employed and can include rights and obligations about leave, salaries, job security, health, and safety requirements. These are rules to ensure a safe working environment and prevent accidental injuries.

The discrimination law:

The Disability Discrimination Act (DDA) looks after individuals with disabilities from discrimination and unfair treatment. The DDA's goal is to eradicate disability discrimination as much as possible, ensure that people with disabilities have the same legal rights as the rest of the community, and promote recognizing and accepting people with disabilities' fundamental rights.

Furthermore, employers are prohibited from discriminating against people with disabilities under the DDA. According to the law, employers must also make appropriate adaptations to the working environment or practices to accommodate the needs of people with impairments. In addition to fostering an anti-discrimination culture, the DDA establishes a complaint-based procedure via which individuals who believe they have been treated unfairly may seek redress, including compensation and reinstatement. Whereas (U.S. Equal Employment Opportunity Commission. 2013) showed how the Americans with Disability Act applies to job applicants and employees. Employers are not allowed to ask employees about their medical conditions under the ADA. However, an employee may disclose their medical condition if the applicant needs a reasonable accommodation to perform specific duties.

5. Conclusion

The findings in different studies indicate that PWE has a higher unemployment rate because of accidents in the workplace. On the other hand, stigmatization, and fear of having seizures in the workplace significantly affected epileptic individuals' work state. Furthermore, some injuries and ignorance to deal with it can prevent PWE from having a normal life. Because of that, every organization should take proper measures to make the work environment conducive for epileptic employees. Besides, employers and co-employers at the workplace may continue to have beliefs and negative attitudes about epilepsy based on either erroneous or no actual experience; it may also further isolate PWE, referred to as stigma. The study portrays those injuries related to epileptic seizures and their consequences that can impact an organization's ability to achieve its goals.

Strength and Limitations:

This scoping review has some limitations. First, a few articles discussed the state of injuries at the workplace and their impact on epileptic individuals' work state. Second, none of the articles mention the cost of insurance for PWE. Third, some studies found that an epileptic condition can cause unemployment, whereas others found no relation between PWE and employment state. On the other hand, this review can be helpful for organizations and managers to educate them about epileptic patients.

The gap in the current literature

There is limited data on seizures and accidental injuries discussed in the state of employment.

Recommendation

Future research could focus on the high unemployment rate among people with epilepsy and injuries related to epilepsy in the workplace. Furthermore, discuss how employers and co-employees should implement safety changes to ensure the working environment is safe for epileptic employees, give attention to employees' education level, and offer a supportive policy to incorporate patients with epilepsy in the workplace better.

Conflict of Interest

No potential conflict of interest.

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