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Anti-Seizure Potential Determination of *Parsonsia Straminea* Stem Bark Ethanol Extract in Mice

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ABSTRACT

Seizure has been known to occur in various countries across the globe in different dimensions as recorded according to the factors. Some of the countries mostly affected are the low income nations with little or no adequate medical treatment access. Such group of disadvantaged community depends more on natural medicine for health maintenance, treatment and cure. The plant *Parsonsia straminea* was sourced from the Wilberforce Island rain forest, Nigeria and herbarium identification number, NDUP/21/001 was given in the Department called Pharmacognosy and Herbal Medicine in Niger Delta University, Nigeria. The collected plant was processed with 70 % ethanol extraction. The study is designed as sub-acute, repetitive dose for 15 days (PTZ & STC) and 21 days for electroshock (kindling). The study was grouped as: control (VEH), 50, 100, 200, 400 & 800 $mgkg^{-1}$ (*P.O*) of *Parsonsia straminea* stem bark ethanol extract. The most pharmacologically preferred dose was used for possible GABA-receptors targeted study. The crude drug of the *Parsonsia straminea* stem bark ethanol extract suggests anti-seizure potential with no sedating effect. The result is a possible promise for anti-seizure management especially in the low income nations that have more access to traditional medicine with narcolepsy management advantage.

Introduction

The communication network of the human or animal body is governed by the nerve circuit derived mainly by ion exchange, which results in electrical signaling system which in most cases is referred to as nerve impulse. The exchange in the nerve circuit creates nerve impulses that cause excitement in the neurons. Some stimuli such as sound pressure or light are also capable of exciting the neuron. Seizure is widely known to be caused by the electrical imbalance that arises from certain brain localization and at some point extends to other brain areas or centers making it general seizure which at most times comes with aura or warning before signs, including uncontrollable muscle movements involving mostly the arms, the trunk, the tongue, as well as salivation, bladder voiding, fecal explosion, ocular hemorrhage among other signs (Hesdorffer et al., 2009). Seizure have known to occur in various countries across the globe in different dimension as recorded according to the factors such as the risk, etiology (Beghi, 2020). However, the Fiest study cohort claimed that "the overall lifetime prevalence of epilepsy was 7.60 per 1,000 porpulation (95% CI 6.17–9.38) and was higher in LMIC (8.75 per 1,000; 95% CI 7.23–10.59) than in HIC (5.18 per 1,000; 95% CI 3.75–7.15)" (Beghi, 2020). Sampled record has shown estimated prevalence size seems to spring in certain ethnicities than others especially among under-developed and developing nations with people of the less privilege social status being the core subjects (Beghi, 2020). Epiletic-seizure is recorded to have higher incidence and prevalence among men more than in women (Hauser et al.,1993; Kaiboriboon et al., 2013). The less prevalence record among the female gender could be owed to the fact that progesterone has suggested seizure ameliorating potential (Kim et al., 2020). More to this, epileptic-seizure presence is more in the oldest and the youngest age groups (Beghi, 2020). The age dependent risk factor is better controlled in the younger age due to more perinatal care, sanitation, and better infection control which cannot be said of the elderly in addition to some poor health co-factors such as, tumors, stroke, neurodegenerative diseases condition. In all these statement of possibilities, traditional management of seizure among the under-developed communities holds more on the medicinal plants. Dwellers of the African continent are better users of these valuable plants as suggested by the African herbal medicine Pharmacopeae. The *Parsonsia straminea* of the Aponcynceae family, though of the south American origin have little or no ethnopharmacological record but have local claims of neuromuscular and seizure controlling effect. This study is in effort to confirm the anti-seizure claims.

Methodology

Ethical Approval. The study model was submitted to the Research Ethics Committee of the University of Port Harcourt, Nigeria and approval with the identity,

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UPH/CEREMAD/REC/MM76/003 was issued for record purpose.

Plant Collection and Extraction. The plant *Parsonsia straminea* was sourced from the Wilberforce Island rain forest, Nigeria and herbarium identification number, NDUP/21/001 was given in the Department called Pharmacognosy and Herbal Medicine in Niger Delta University, Nigeria. The collected plant was processed with 70 % ethanol extraction according to the method described by Trease and Evans as reported by (Abdulahi & Mainul, 2020).

Animal. Mice was the laboratory animal of interest in this study. They were raised in the animal house unit of the Department of Pharmacology and Toxicology, Niger Delta University, Nigeria according to the prescribed international standard practice (NIOSH, 1998; NHMRC, 2013).

Study Plan

The study is designed as sub-acute, repetitive dose for 15 days (PTZ & STC) and 21 days for electroshock, ES (kindling). The study was grouped as: control (VEH), negative control, (except, ES model) 50, 100, 200, 400 &800 $mgkg^{-1}$ (P.O) of *Parsonsia straminea* stem bark ethanol extract. The most pharmacologically preferred dose was used for possible GABA-receptor targeted study.

Anti-seizure Evaluation

The anti-seizure evaluation of *P.straminea* stem bark was staged in 3 study models, Pentylenetetrazole (PTZ), Strychnine (STC) and Electroshock (ES) with sub-maximal and maximal dose for induction of seizure in every model indicated above using male and female mice respectively. Every study group in all models uses 6 mice (male and female) respectively in 6 study groups per model and treated as: group 1: VEH (10 mL/kg); group 2: negative control (35 mgkg PTZ/ 0.1 mg/kg STC); group 3: 100 mg/kg P.S; group 4: 200 mg/kg P.S; group 5: 400 mg/kg P.S; group 6: 5 mg/kg DZP (Kemelayefa & Kagbo, 2018, Kemelayefa et al., 2022).

Pentylenetetrazole (PTZ) Induced Seizure Study Model

Sub-maximal (kindling) induction. Kindling induced seizure study model was achieved within 15 days of daily treatment in the animals with 35 mg/kg of PTZ in all treatment groups, group 1: VEH (10 mL/kg); group 2: negative control 35 mg/kg PTZ; group 3:100 mg/kg P.S; group 4: 200 mg/kg P.S; group 5: 400 mg/kg P.S; group 6: 5 mg/kg DZP (Shimada & Yamagata, 2018).

Maximal induction.The animals in their respective groups were treated with group 1: VEH (10 mL/kg); group 2: 100 mg/kg P.S; group 3: 200 mg/kg P.S; group 4: 400 mg/kg P.S; group 5: 5 mg/kg DZP, daily for 15 days. Two hours after the last treatment, the animals were seizure-induced chemically with PTZ 100 mg/kg and seizure recorded as onset of seizure and duration of seizure in all groups.

Strychnine Induced Seizure Study Model

***Sub-maximal (kindling) induction*.**The procedure followed as explained in the PTZ kindling model above with difference in the sub-maximal dose of STC as 0.1 mg/kg.

Maximal doses for induction. The procedure mimics the PTZ model with difference in the dose of STC, 2 mg/kg (Larson & Beitz 1988).

Electroshock (ES) induced seizure model

Sub-maximal electroshock, SES (kindling) model. The animals were grouped like the other sub-maximal study models above but without negative control group. The animals in their respective groups; group 1: VEH (10 mL/kg); group 2: 100 mg/kg P.S; group 3: 200 mg/kg P.S; group 4: 400 mg/kg P.S; group 5: 5 mg/kg DZP, were daily treated and sub-maximally stimulated electrically for 21 days to achieve an auto-convulsive episode at 30 mA voltage, 100 pulse/sec frequency, 10 sec duration using ugo basile electro-convulvsive device, pulse generator for animal model (Italy). The duration of seizures was recorded each day per group through the study period (Zeba et al., 2017).

Maximal electroshock induced convulsion MES. Like the maximal dose in the chemical model, the animals were electrically convulsed with voltage of 90 mA, 100 m/sec frequency, 30 sec duration and the duration of seizure were recorded (Zeba et al.,2017).

Possible Drug Receptor Interaction

To investigate the possible involvement of $GABA_A$ receptors in the anticonvulsant action of *P.straminea*, five mice were pre-treated with flumazenil,a selective benzodiazepine receptor antagonist (2 mg kg^{-1}, i.p.) per group except normal control, 15 min before *P.straminea* (400 mg kg^{-1}, *p.o.*) or DZP (5 mg kg^{-1} , i.p.) administration. After 45 min, mice were challenged subcutaneously with PTZ (100 mg kg^{-1}) and assessed for latency to seizure and duration of seizure. Group 1: normal control, 2: 400 mg/kg PS; 3: 400 mg/kg PS + 5 mg/kg DZP; 4: 5 mg/kg DZP

Statistical Analysis

Laboratory data were statistically analyzed using graph pad prism 8.3 with results presented as mean, standard error of mean as well as graphically. All data were subjected to multiple comparison post hoc test except otherwise.

Result

Anti-Seizure Assessment

Kindling in PTZ & STC

The result in figure 1 revealed anti-seizure potential of *P.straminea* stem bark at the male group of the PTZ study models with statistical significance at day 1.

Day 2 result revealed anti-seizure potential of *P.straminea* stem bark at the male group of the PTZ study models with statistical significance, figure 2.

Anti-seizure potential was indicated in STC study model more than those of the PTZ study model, figure 3.

Day 4 anti-seizure evaluation indicated seizure ameliorating potential in the male group of STC, female and male groups of PTZ study model, see figure 4.

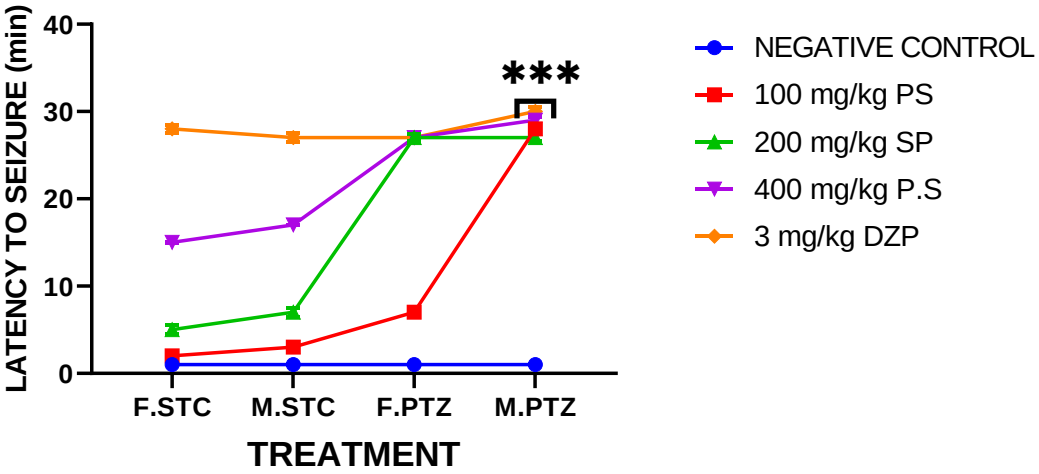

Figure 1. Sub-Acute treatment of Anti-Seizure Evaluation for PTZ/STC: Day 1

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Anti-seizure measured using graph pad prism 8. ANOVA post hoc test (tukey) ***= significant (P<0.001).

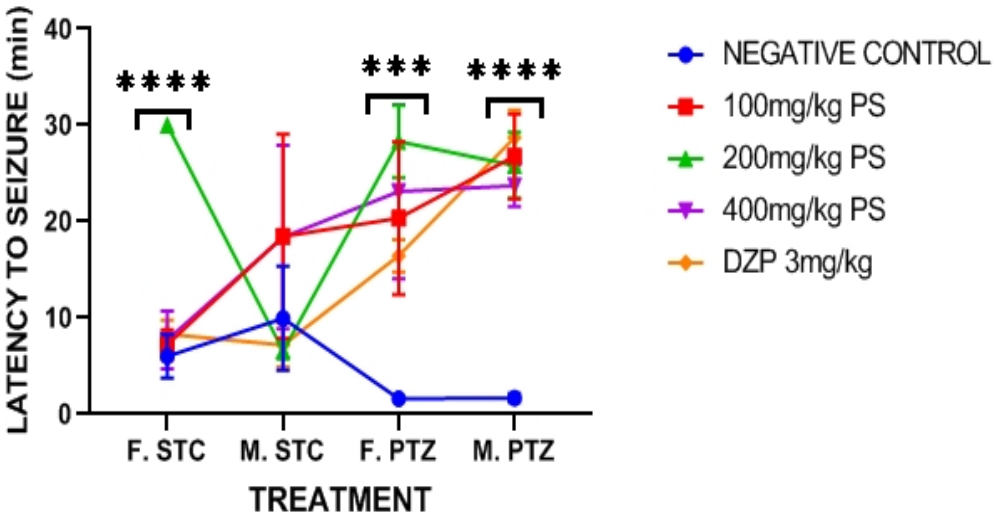

Figure 2. Sub-Acute treatment of Anti-Seizure Evaluation for PTZ/STC: Day 2

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey) ***= significant (P<0.001).

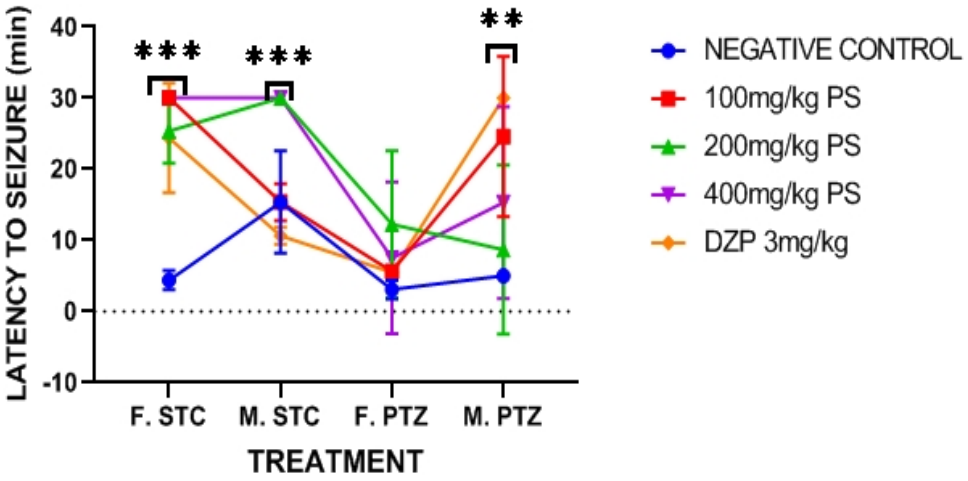

Figure 3. Sub-Acute treatment of Anti-Seizure Evaluation for PTZ/STC: Day 3

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey) **= significant (P<0.004)***= significant (P<0.001).

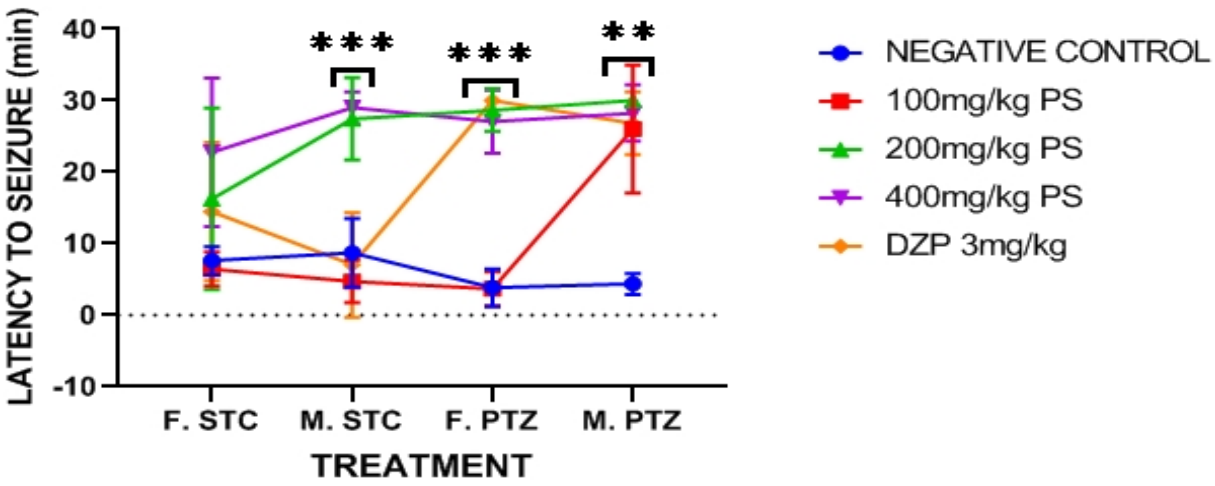

Figure 4. Sub-Acute treatment of Anti-Seizure Evaluation for PTZ/STC: Day 4

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey) **= significant (P<0.004)***= significant (P<0.001).

Maximal Dose Evaluation

The test groups, that is the *P.Straminea* Stem Bark Extract groups indicated prolong duration of seizure in the peak dose evaluation of PTZ study model significantly, figure 5.

Figure 6,showed no statistical significance in either onset or duration of seizure in both male and female. This also indicates no pharmacological promise of anti-seizure in the strychnine study model.

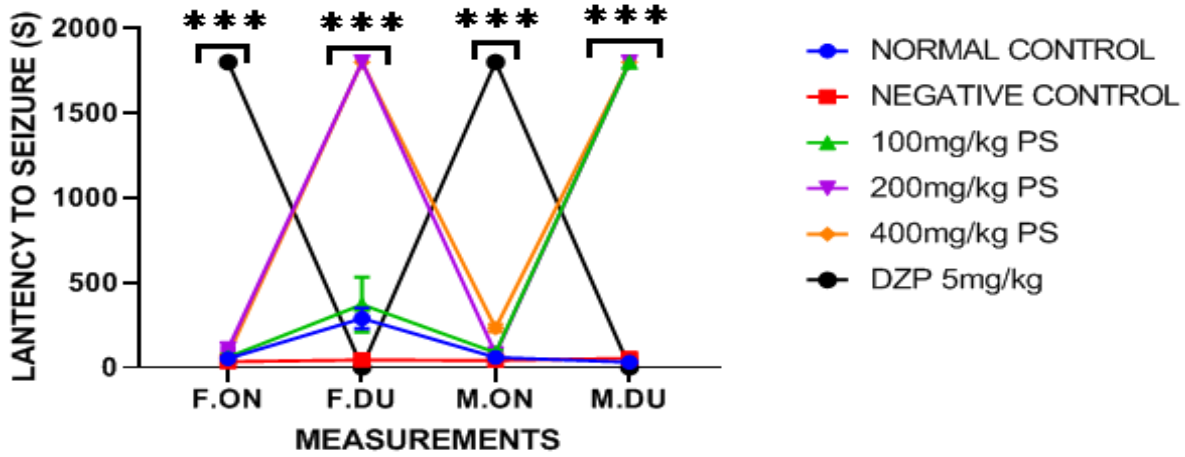

Figure 5. Sub-Acute Treatment Anti-Seizure Evaluation for PTZ: Peak Dose Evaluation

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey)***= significant (P<0.001). F.ON=Female Onset of seizure, F.DU= Female Duration of seizure, M.ON= Male Onset of seizure, M.DU= Male Duration of seizure.

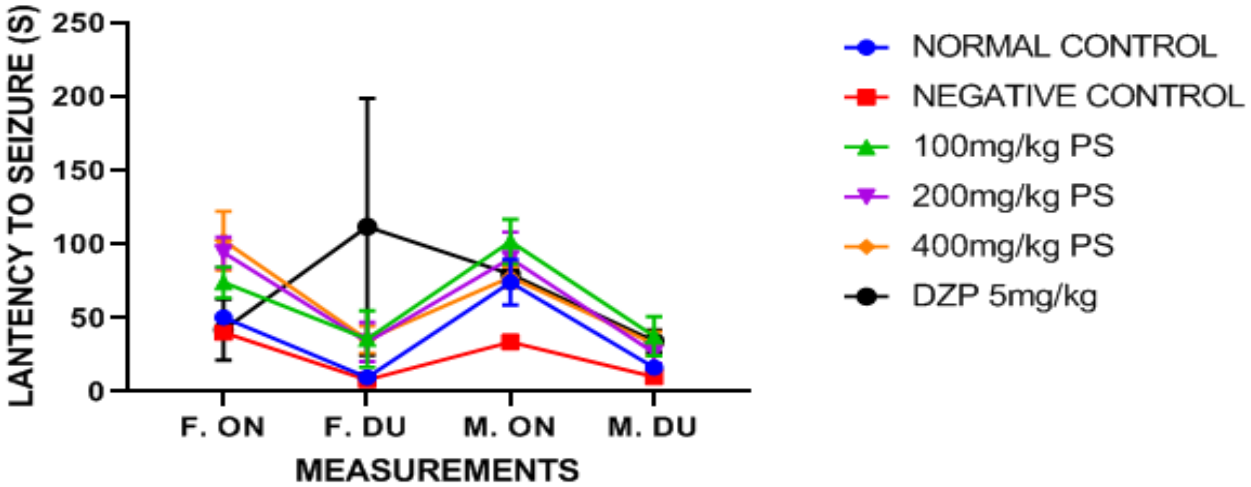

Figure 6. Sub-Acute Treatment Anti-Seizure Evaluation For STC: Peak Dose Evaluation

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey) ns= not significant (P>0.05). F.ON=Female Onset of seizure, F.DU= Female Duration of seizure, M.ON= Male Onset of seizure, M.DU= Male Duration of seizure.

Survival Evaluation

The kindling study ends with mortality recorded among the negative control, 100 mg/kg, 200 mg/kg female groups in the PTZ model and survival noted among the 400 mg/kg PS, 5 mg/kg female as well as all groups of the male mice in the PTZ study model except the negative control. The survival noted was over two weeks without a single death, figure 7.

Contrary to the PTZ study model, the strychnine model showed no appreciable survival rate as rated in seconds, figure 8.

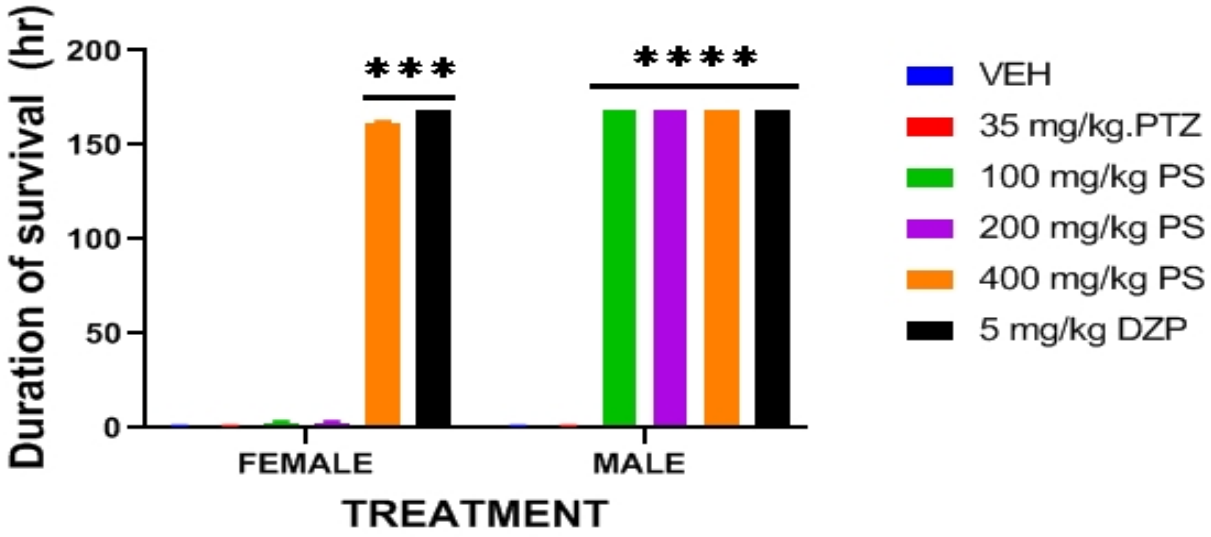

Figure 7. Sub-Acute treatment of Anti-Seizure Evaluation for PTZ: Peak Dose Survival Evaluation

VEH = Vehicle/control, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey)***= significant (P<0.001); ****= significant (P<0.0001).

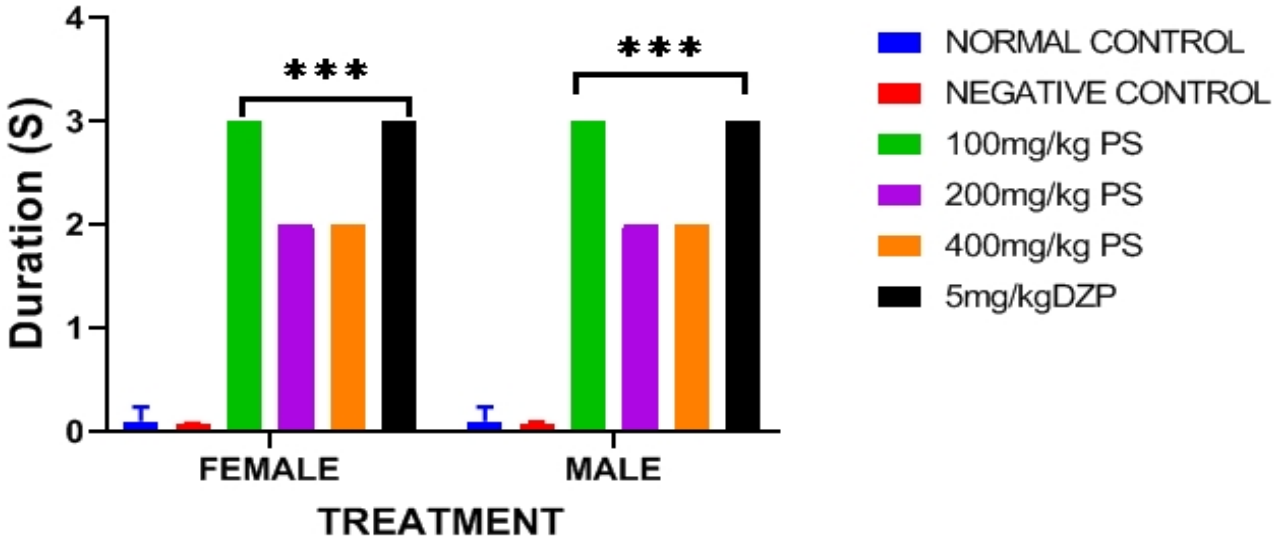

Figure 8. Sub-Acute treatment of Anti-Seizure Evaluation for STC: Peak Dose Survival Evaluation

Negative control= 0.1 mg/kg stc, 35 mg/kg ptz, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey)***= significant (P<0.001).

***Electroshock (ES)* Kindling**

The test groups of the *P.straminea* stem bark extract revealed reduced duration of seizure with statistical significance compared to the control group as well as the standards in the female study groups, table 1.

The male study group showed no difference in the study outcome from the female group, table 2.

Table 1. Electro-shock Kindling seizure: Female mice

DAYS	VEH	5 mg/kg.DPZ	100 mg/kg.PS	200 mg/kg.PS	400 mg/kg.PS	100 mg/kg.PHT
1	30.0±4.9	11.3±3.4***	11.0±1.5***	14.01.5±***	11.3±2.3***	11.7±0.8***
2	23.0±1.5	8.0±2.0***	17.3±1.7***	16.0±2.3***	18.7±2.6**	15.3±3.3**
3	34.3±1.2	13.3±3.3***	25.0±6.0*	21.7±0.3*	16.7±1.4**	35.0±5.6
4	37.0±1.0	10.0±2.8***	29.0±4.9	23.0±2.5*	28.0±2.3	35.3±5.9
5	33.3±1.3	11.0±0.5***	17.3±2.3***	24.7±1.7*	32.0±3.5	38.3±1.7
6	34.0±1.0	35.0±11.5	23.3±2.8*	23.7±3.6*	23.7±1.2*	36.3±9.8
7	39.0±3.7	16.7±1.6***	25.3±1.7*	30.0±4.0	29.3±4.4	48.0±3.0
8	37.0±3.7	32.7±7.8	32.7±4.3	35.0±0.5	28.3±3.7	52.7±
9	42.7±5.5	38.0±2.5	30.0±3.7*	33.0±7.0*	28.0±5.2*	51.0±5.5
10	52.3±3.9	38.7±2.9	28.0±4.0**	38.7±2.3*	37.7±0.8*	48.7±4.9
11	51.3±3.5	37.3±1.4*	28.3±5.2**	40.3±1.8	31.0±5.5*	55.3±8.6
12	48.7±4.6	41.3±3.1	28.3±5.2**	28.7±3.5**	31.0±1.5*	49.0±4.3
13	50.7±5.4	39.7±8.4	26.3±1.8**	25.3±4.8**	36.0±1.5*	49.0±4.3
14	52.7±7.0	49.3±5.4	30.0±4.5*	32.3±1.4*	28.7±4.4**	47.3±3.6
15	47.0±3.0	50.7±9.3	27.7±2.4*	38.0±2.0	37.7±3.1	48.0±4.1
16	58.7±5.2	50.0±4.6	38.7±5.8*	33.0±5.6**	33.7±2.7**	53.3±3.1
17	56.0±2.0	43.7±10.9	43.7±2.0	35.7±1.7**	32.7±1.7**	43.7±2.8
18	54.0±2.0	55.3±12.3	40.0±5.2	37.7±2.6**	37.0±1.1**	51.3±2.8
19	50±3.4	70.3±5.3	41.3±0.8	30.7±3.5**	38.0±3.6*	48.3±4.6
20	52.3±1.8	48.3±8.4	42.0±1.1	35.0±1.5*	37.0±2.5*	55.0±3.0
21	59.0±0.5	39.7±5.2*	40.3±1.8**	30.7±3.0**	33.7±1.5**	46.3±9.3

Sub-maximal electroconvulsive shock to establish kindling seizure; 30 mA, 10 sec duration, 100 pulse/sec frequency with Ugobasile electro shock machine. Data was evaluated using graph pad prism 8.3 ANOVA, row stat/ post hoc test (tukey multiple comparisons). *** indicates P<0.0001, ** indcates P<0.001, * indicates P<0.5. VEH. = Control group, DZP. = Diazepam, P.S.= Pasonsia stremenea extract, PHT = Phenytoin.

Table 2. Electro-shock Kindling seizure: male mice

DAYS	VEH	5 mg/kg.DPZ	100 mg/kg.PS	200 mg/kg.PS	400 mg/kg.PS	100 mg/kg.PHT
1	28.0±3.9	11.1±3.4***	11.0±1.5***	14.01.5±***	11.1±2.3***	11.2±0.8***
2	23.0±1.5	8.3±2.0***	17.3±1.7***	16.0±2.3***	18.3±2.6**	15.2±3.3**
3	24.3±1.2	13.1±3.3***	25.0±6.0*	21.2±0.3*	16.1±1.4**	35.0±5.6
4	27.0±1.0	10.0±2.8***	29.0±4.9	23.0±2.5*	28.0±2.3	35.3±5.9
5	33.3±1.3	11.0±0.5***	17.3±2.3***	24.7±1.7*	32.0±3.5	38.3±1.7
6	34.0±1.0	35.0±11.5	23.3±2.8*	23.7±3.6*	23.7±1.2*	36.3±9.8
7	37.0±3.7	16.4±1.6***	25.3±1.7*	30.0±4.0	29.3±4.4	48.0±3.0
8	37.0±3.7	32.3±7.8	32.4±4.3	35.0±0.5	28.3±3.7	52.7±
9	40.7±5.5	38.0±2.5	30.0±3.7*	33.0±7.0*	28.0±5.2*	51.0±5.5
10	42.3±3.9	38.7±2.9	28.0±4.0**	38.7±2.3*	37.7±0.8*	48.7±4.9
11	51.3±3.5	37.3±1.4*	28.3±5.2**	40.3±1.8	31.0±5.5*	55.3±8.6
12	47.7±4.6	41.3±3.1	28.3±5.2**	28.7±3.5**	31.0±1.5*	49.0±4.3
13	50.7±5.4	39.7±8.4	26.3±1.8**	25.3±4.8**	36.0±1.5*	49.0±4.3
14	50.7±7.0	49.3±5.4	30.0±4.5*	32.3±1.4*	28.7±4.4**	47.3±3.6
15	47.0±3.0	50.7±9.3	27.7±2.4*	38.0±2.0	37.7±3.1	48.0±4.1
16	58.7±5.2	50.0±4.6	38.7±5.8*	33.0±5.6**	33.7±2.7**	53.3±3.1
17	54.0±2.0	43.7±10.9	43.7±2.0	35.7±1.7**	32.7±1.7**	43.7±2.8
18	54.0±2.0	55.3±12.3	40.0±5.2	37.7±2.6**	37.0±1.1**	51.3±2.8
19	50±3.4	70.3±5.3	41.3±0.8	30.7±3.5**	38.0±3.6*	48.3±4.6
20	52.3±1.8	48.3±8.4	42.0±1.1	35.0±1.5*	37.0±2.5*	53.0±3.0
21	57.0±0.5	39.7±5.2*	40.3±1.8**	30.7±3.0**	33.7±1.5**	47.3±9.3

Sub-maximal electroconvulsive shock to establish kindling seizure; 30 mA, 10 sec duration, 100 pulse/sec frequency with Ugobasile electro shock machine. Data was evaluated using graph pad prism 8.3 ANOVA, row stat/ post hoc test (tukey multiple comparisons). *** indicates P<0.0001, ** indicates P<0.001, * indicates P<0.5. VEH. = Control group, DZP.= Diazepam, P.S.= Pasonsia stremenea extract, PHT = Phenytoin.

Maximal Treatment

The maximal electroshock study model revealed reduced duration of seizure in both male and female study groups suggesting anti-seizure potential of *P.straminea* stem bark, figure 9.

Survival was also noted in both male and female groups of the maximal electroshock study model, figure 10 and 11.

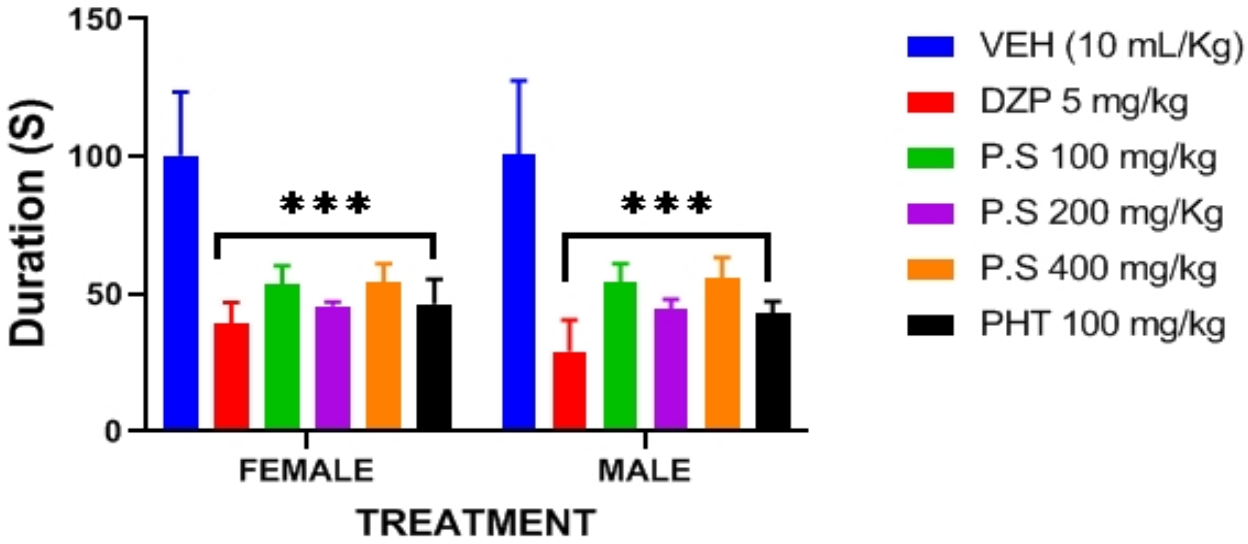

Figure 9. Maximal Electroshock Seizure

Maximal Electroconvulsive Shock to establish seizure; 90 mA, 30 sec duration, 100 pulse/sec frequency with Ugobasile electro shock machine. Data was evaluated using graph pad prism 8.3 ANOVA, row stat/ post hoc test (tukey multiple comparisons). *** indicates P=0.0001, VEH. = Control group, DZP.= Diazepam, P.S.= Parsonsia straminea extract, PHT = Phenytoin.

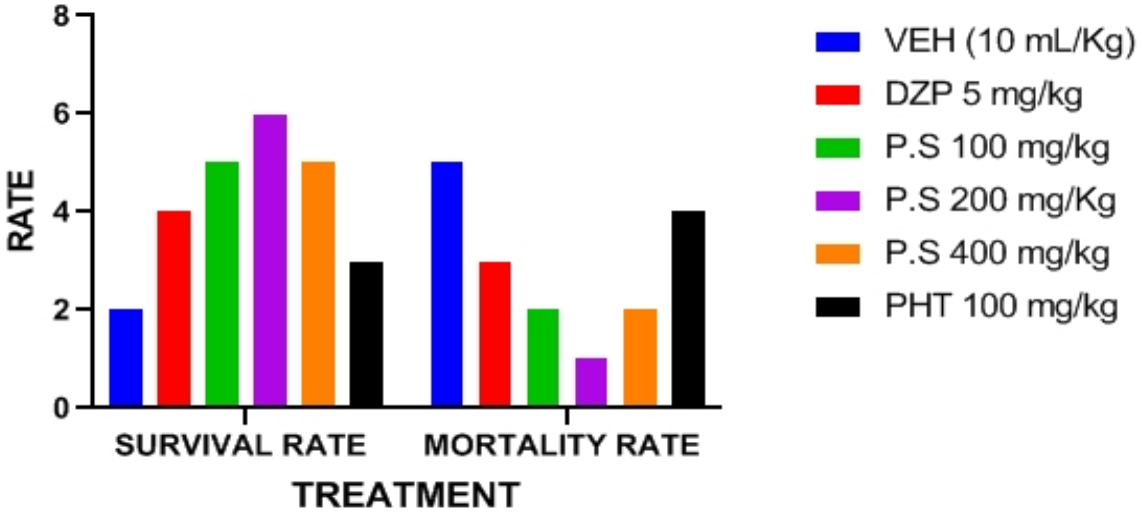

Figure 10. Survival/ Mortality rate: female mice

The results showed that the test groups survived the electroshock kindling episode of the study of at least not less than 4 animals (66.7%) out of the 6 animals (100%) per group.

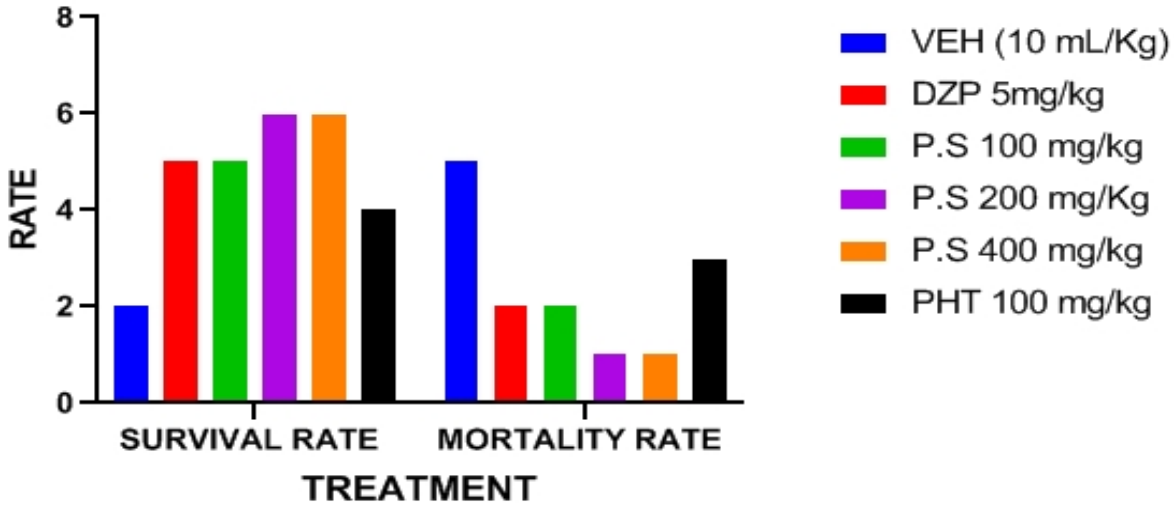

Figure 11. Survival/ Mortality rate: male mice

The results showed that the test groups survived the electroshock kindling episode of the study of at least not less than 5 animals (83.0%) out of the 6 animals (100%) per group.

Possible Drug Receptor Interaction

The entire study models revealed the PTZ model to be more pharmacological potent against seizure. Following this assertion arising from both the kindling and the maximal study, it can only be accepted that the possible action pathway is the GABAergic system. Thus, the maximal effective dose was subject to verification by doing further study along with a benzodiazepine blocker, flumazenil to determine the effect on $GABA_A$ receptor. It was noted that the diazepam blocker does not have absolute blocking effect on the *P. straminea* stem bark rather potentiate diazepam in both male and female study group, figure 12. Irrespective of gender, the action of flumazenil remains same as seen in figure 13. Figure 14 gives better understanding of treatment without flumazenil.

Figure 12. Flumazenil Interaction

Pentylenetetrazole induced seizure group evaluated for flumazenil influence on the drug receptor site. VEH = Vehicle/control, PS= *P.Straminea* Stem Bark Extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (tukey), ***= significant (P<0.0002) compared with # = negative control, 2 mg/kg FLZ (flumazenil).

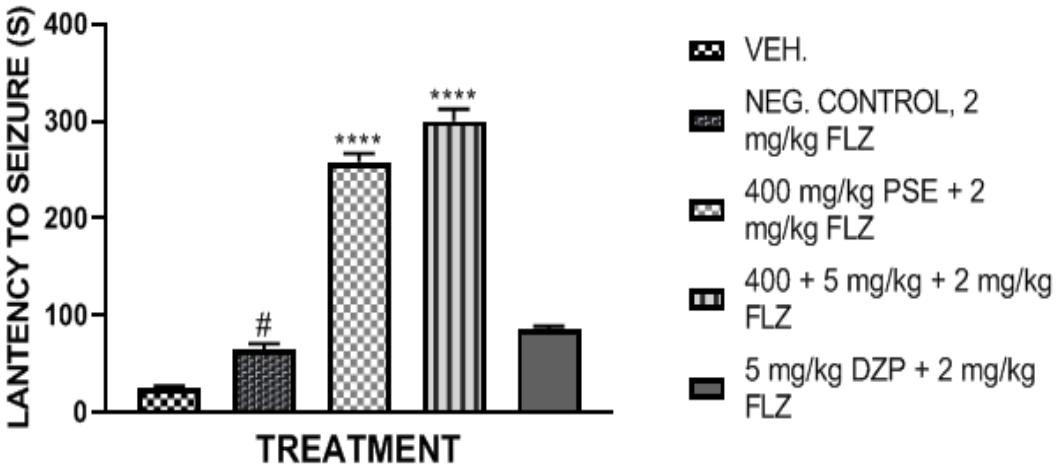

Figure 13. With Flumazenil

VEH = Vehicle/control, PSE= *P.Straminea* stem bark extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (turkey), ****= significant (P<0.0001). compared with # = 2 mg/kg FLZ (flumazenil).

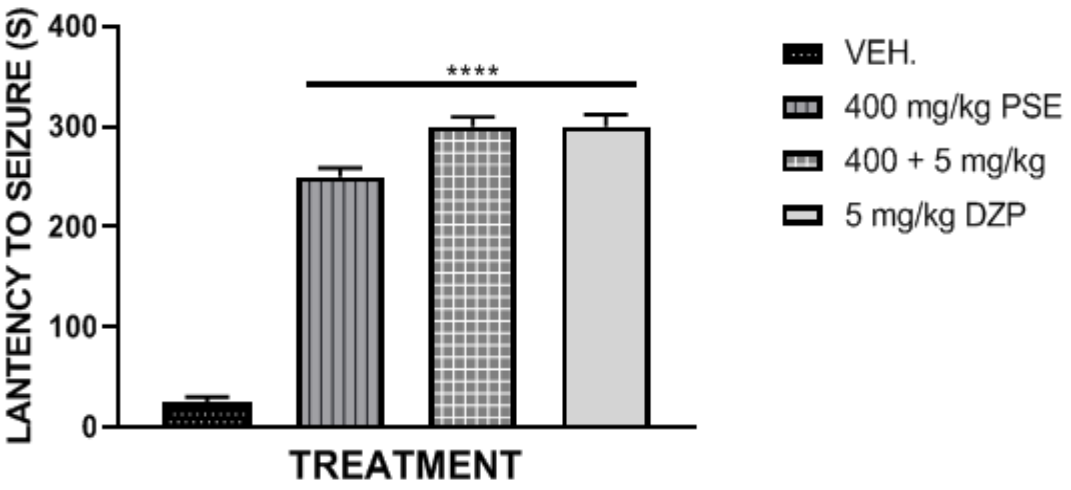

Figure 14. Without Flumazenil

VEH = Vehicle/control, PSE= *P.Straminea* stem bark extract. Antiseizure measured using graph pad prism 8. ANOVA post hoc test (turkey), ***= significant (P<0.001) compared with the control group.

Discussion

About 80% of individuals with incidences of epilepsy in underdeveloped and developing countries, especially in Asia and Africa with obvious low economic threshold have shown to have difficulty in managing the non-communicable chronic disease of the brain, (WHO, 2022). It has been estimated that 70% of the epileptic seizure populace secure proper diagnoses and treatment. Premature death among people living with epileptic seizure is estimated to be trice more than the general population of other causes of death (Devinsky, 2016) and this occurs in the low income nations coupled with stigmatization, big setback to the sufferers (WHO, 2022). The economically compromised populace can only help themselves through the use of the traditional medicine which is very much available to them. The screening of *P.Straminea* stem bark extract offer safety and re-assurance opportunity to the traditional medicine users. The safety of everything consumed by human remained paramount in the business of healthcare provision. This study shown anti-seizure potential among the male group of PTZ study models in all doses employed in this study, figure 1,2,4, 6, 7. This result may be supporting other studies that revealed female hormone such as estradiol to have reducing seizure threshold effect, contrary to the male group with same study suggesting hormone such as testosterone and progesterone increasing seizure threshold, (Motta, 2000) which implies to potentiate anti-seizure agents.

The GABA receptor targeted study have revealed that the *P.Straminea* stem bark extract do not share same receptor site of action in the GABA receptor complex with diazepam completely which suggests the reason for the lack of sedative effect as seen in an early study, behavioral evaluation of *P.Straminea* stem bark extract (Kemelayefa et al, 2022). The study rather suggests activities similar to the effect of imidazenil, a non-sedative anti-convulsant with record of more anti-seizure potency than diazepam, (Kadriu et al, 2009), see figure 12-14. The action of flumazenil on the stembark extract of *P.straminea* portrays as a neutral modulator of the GABA receptor binding site because it seems not have direct effect on the activity of the extract but rather reduce binding to the allosteric site which seems to mostly affect diazepam.

Conclusion

The result is a possible promise for anti-seizure management especially in the low income nations that have more access to traditional medicine. The non-sedating property of the *P.Straminea* stem bark extract remains an advantage over the conventional anti-convulsants and possible agent for managing narcolepsy.

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Conflict of Interest

Authors declare no conflict of interest in this study

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