

to an on-going study with mesh, thus most mesh repairs are done without extra cost on the patients.

There is no consensus among anaesthetists and surgeons regarding the best choice of anaesthesia for inguinal hernia repair. Several retrospective and randomized control trials have shown that local anaesthesia provides the best clinical and economic benefits to patients.⁹⁻¹³ In spite of this, the use of local anaesthesia among some researchers is not a common practice.^{4,6,14} This study showed that the use of spinal anaesthesia (47.5%) for hernia repair was the dominant anaesthetic technique (LA=34.1%, GA=18.4%) practiced at our centre. This is similar to reports by some previous authors.^{4,6,14} Ilori⁴ in a surgical outreach by the West African College of Surgeons in Ogoja Nigeria reported that hernia repairs accounted for 67% of the surgeries performed and spinal anaesthesia was the dominant anaesthetic technique (68.8%). Similarly, Awe et al⁶ in a recent study on hernia in a tertiary health institution in Nigeria documented 100% use of spinal anaesthesia in 172 cases. In the same vein, local anaesthesia (16.1%) was documented to be the least used anaesthetic technique in inguinal hernia repair by Mbah¹⁵ in a series of 199 cases in northwestern Nigeria. This is in contrast to the high use of LA in several other studies.^{16,17,18} LA for inguinal hernia repair is used almost exclusively in specialist hernia centres and public hospitals with interests in hernia surgeries in UK. Similarly, Ojo et al.¹⁷ and Dienye et al¹⁶ in rural surgical outreach and rural clinic practice respectively in Nigeria have documented a high use of LA for inguinal hernia repair. This lack of consensus among practitioners on the choice of anaesthesia for inguinal hernia repair has been attributed to institutional tradition concerning hernia surgery⁷ and probably surgeon's preference, anaesthetist's interest in regional anaesthesia, among other factors.

In our centre, there is no existing protocol on anaesthesia for inguinal hernia repair. The surgeons are divided between LA, SA and GA, and being a minor procedure, majority of the hernia repairs are anaesthetized by residents in anaesthesia and nurses anaesthetists who are not very experienced in regional blocks. The few exceptions are in instances of high-risk cases where a consultant experienced in regional anaesthesia performs illio inguinal-illiohypogastric nerve blocks. Also, some of our surgeons are not experienced in regional blocks

for hernia repair. Their local infiltration often results in inadequate analgesia hence the use of sedatives like diazepam, and analgesics like pentazocine and subanaesthetic doses of ketamine was higher with LA (84.7%) in our study. Both pentazocine and ketamine have sedative properties. This probably explains why anaesthesia residents prefer spinal anaesthesia ab initio. Wang¹⁹ in an editorial questioned why LA for inguinal herniorrhaphy was underused. He attributed some of the reasons to include traditional preference for general or spinal anaesthesia, unfamiliarity of the anaesthetic technique by anaesthetic providers or surgeons as well as the anatomic variation in the illioinguinal-illiohypogastric nerve distribution. He suggested that the use of ultra-sound in illioinguinal-illiohypogastric nerve block might improve the success.

Several studies have demonstrated LA to be a safer anaesthetic technique compared to SA and GA.⁸ This conclusion is supported by our study, which showed SA to have the highest rate of complications; hypotension (10.6%) and bradycardia (34%), both of which were successfully treated, where observed only in patients who received SA. Other complications of SA such as urinary retention, post dural puncture headache, etc were not recorded since our data collection was limited to anaesthetic charts, theatre and ward registers.

Our study showed a low overall day-case rate of 37.6%. A similar low day-case rate (2%) was reported by Mbah¹⁵ in a series of 199 cases in which the dominant anaesthetic technique was GA (57.6%) and SA (26.1%). A high day-case rate has been reported in studies where LA for inguinal hernia repair was higher. Our study showed that a higher day- case rate (84.6%) was associated with LA compared to SA (16.8%) and GA (7.6%).

Regarding ambulatory anaesthesia, illio-inguinal/illio-hypogastric nerve block has been shown to have multiple advantages over spinal anaesthesia, including shorter time-to-home readiness, quicker oral intake post surgery, and no need for post anaesthesia care unit (PACU) or recovery room care. These advantages are obviously consistent with the current concept of the fast-track ambulatory anaesthesia.^{19,20} Usang and colleagues²¹ demonstrated the safety and acceptability of day case surgery in their series of 88 children in Nigeria. They concluded that if adopted, it could reduce the burden of a long list of patients with hernia waiting for ward spaces to

Protective Role of Diets Containing *Vernonia amygdalina* Leaves on Streptozotocin- Induced Oxidative Stress and Liver Damage

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ABSTRACT

Oxidative stress and liver damage occur in diabetes mellitus. The objective of this study was to determine some biomarkers of oxidative stress and liver damage in Streptozotocin -induced diabetic wistar rats consuming diets containing Vernonia amygdalina leaves in order to evaluate the involvement of the diet in the management of oxidative stress and liver damage common among diabetics. The design consisted of fifty rats randomly divided into five groups (1-5) with 10 rats per group. The Research took place at the Department of Biochemistry, University of Calabar, Nigeria between March, 2011 and May, 2012. Group 1 (normal control) was fed with control diet; Group 2 (diabetic control) was fed with control diet, Group 3 and 4 (diabetic treated) were fed with Vernonia amygdalina at 5% and 7.5%, respectively. Group 5 (diabetic treated) was fed with control diet and treated with insulin. Diabetes mellitus was induced in the diabetic groups by intraperitoneal injection of 55mg/kg body weight of Streptozotocin, (STZ) reconstituted in 0.1M sodium citrate buffer. Feed and water were given ad- libitum for 28 days. Results showed that diabetic rats in groups 3 and 4 consuming Vernonia amygdalina had significant (p<0.5) decrease in MDA concentration and significant increase in the activity of GPx, SOD and Catalase relative to the diabetic control. Diabetic rats consuming Vernonia amygdalina also had significant reduction (p<0.5) in the level of ALT, AST, and ALP relative to the diabetic control. The results for diabetic rats in groups 3 and 4 consuming Vernonia amygdalina diets were superior to those on Insulin (group 5) for the measured parameters and were not significantly different (p<0.5) when compared to the normal control rats (group 2). We concluded that consumption of diets containing Vernonia amygdalina leaves has protective effect against oxidative stress and liver damage associated with diabetes mellitus and might constitute a diet- based treatment or adjunct for management of oxidative stress and liver diabetes mellitus.

Key words: Diet, Diabetes, *Vernonia amygdalina*, oxidative stress, liver damage.

INTRODUCTION

Oxidative stress is a condition of excess formation of freeradicals and insufficient removal of highly reactive molecules such as reactive oxygen species (ROS) and reactive nitrogen species (RNS).^{1,2} Oxidative stress plays a pivotal role in the development of diabetes complications, both microvascular and cardiovascular.¹ The metabolic abnormalities of diabetes cause mitochondrial superoxide overproduction.¹ This increased superoxide production is the central and major mediator of diabetes associated tissue damage, causing the

activation of 5 pathways involved in the pathogenesis of complications and direct inactivation of 2 antiatherosclerotic enzymes namely: endothelial nitric oxide synthase and prostacyclin synthase.³ To prevent oxidative inactivation of these key enzymes, in addition to preventing activation of the pathways discussed above, it is necessary to directly reduce the amount of superoxide.⁴ Data strongly supports that therapeutic correction of diabetes-induced superoxide overproduction may be a powerful approach for preventing diabetic complications.^{4,5}

Existing methods of treating diabetes do not prevent diabetic complications; therefore new mechanism-based therapeutic strategies are needed.^{4,5} Potential therapeutic agents such as transketolase activator, catalytic antioxidants such as the family of SOD/catalase mimetic compounds and dietary antioxidants are current areas of scientific interest.^{4,5} Conventional antioxidants do not prevent diabetic complications effectively⁶ (especially in sustained

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hyperglyceamia) because conventional antioxidants neutralize reactive oxygen molecules on a one-for-one basis, whereas hyperglycemia-induced overproduction of superoxide is a continuous process.⁷ Diet high in vegetables and fruits are more beneficial than conventional antioxidants since they contain plethora of antioxidants and other significant dietary factors.⁶ For example, eight chemical forms of vitamin E are present in foods.⁶ Vitamin E supplements, on the other hand, typically include only one of these formsalpha-tocopherol. Alpha-tocopherol also has been used in almost all research studies on vitamin E. Based on the observations of the beneficial effects of dietary antioxidants in the management of diabetic complications, there has been increased publications in this area. Novel products that could become alternative to drug therapy with no or fewer side effects are desirable.^{6,7} The effect of consumption of diet containing *Vernonia amygdalina* leaves on oxidative stress in diabetes has not been studied before. This study determines some biomarkers of oxidative stress in streptozotocin induced diabetic rats consuming *Vernonia amygdalinava* leaf diet so as to evaluate the potential role of the diet in the management of oxidative stress in diabetics. The hypothesis is that if the diet has any impact on oxidative stress in diabetes, some changes will be observed in biomarkers of oxidative stress of diabetic rats consuming the diets compared to control.

Vernonia amygdalinava leaf is obtained from *Vernonia amygdalina* Del popularly known as bitter leaf in most part of Africa. It is a species of *Vernonia* and belongs to the family of compositae (*Asteraceace*). It is used to prepare soup and as a spice for many dishes. Its consumption is popular in many African countries. This research is significant because it could help to expand treatment option and may have considerable impact in areas where people consume this leaf and conventional treatment cannot be assessed or afforded, especially in Africa and other developing countries. In Africa the prevalence of diabetes is rising and comparatively high in young to middle-aged people unlike the West where the older are most affected. This may have long-lasting adverse effects on the nation's health and economy, therefore immediate, alternative and available remedies are needed.

MATERIALSANDMETHODS

Collection and Processing of Plant Materials

Fresh but matured leaves of *Vernonia amygdalina* Del were collected from the Endocrine Research Farm, University of Calabar, and from University of Calabar Staff Village, Calabar in March, 2011. These leaves were authenticated by a Taxonomist and Voucher Specimens were deposited in the herbarium in the Department of Botany, University of Calabar. The leaves were selected to remove extraneous materials, washed and rinsed with distilled water and dried under shade until the leaves were well dried. Dried leaves were milled using commercial feed mill machine (Artec model 40) to powder and sieved with 1mm mesh to obtain fine leaf powder. Fine leaves powder were packaged in a well labeled amber container and stored in the refrigerator at temperature 2-8⁰C until used for the preparation of rat chow.

Formulation of Experimental Diets

Feed ingredients include: leaf powder, soybean meal, maize meal, Garri, mineral/ vitamin premix, L-lysine L-methionine and corn oil. Standard rat chows (grower) were formulated according to the National Research Council (NRC)⁸ (Table1). Three (3) different diets were formulated namely: Control, VA-5%; and VA-7.5%. All diets were isocaloric and isonitrogenous. The percentage composition and nutrient analysis of the experimental diets are shown in Table 1.

Animals

Fifty (50) albino rats of Wistar strain (female only) weighing between 83-121g were purchased from the animal house of the Faculty of Basic Medical Science, University of Uyo, Uyo, and transported in well ventilated cages to the animal house of the Department of Biochemistry, University of Calabar, Cross River State, where they were kept throughout the duration of the experiment. Female rats only were used for the experiment to eliminate any possible sex influence on the results. The animals were allowed to acclimatize for two weeks. They were housed in well ventilated cages (wooden bottom and wire mesh top) and kept under controlled environmental conditions of temperature (25 ± 5°C), relative humidity (50 ± 5%) and twelve hour light/dark cycle. Approval was granted by the ethic committee of the College of Basic Medical Science, University of Calabar and the animals

Table 1: Age, Sex, ASA Status, Patterns of Presentation and Duration of Surgery

Category	Value (%)
Sex	
Male	118(83.7)
Female	23(16.3)
Total	141(100.0)
Age(yrs)	
18 - 77	44.3
ASA Status	
I	80 (56.4)
II	31 (22.3)
III	26 (18.1)
IV	4 (3.2)
Total	141 (100)
Presentation	
Unilateral	123 (87.2)
Bilateral	18 (12.8)
Elective	108 (76.6)
Emergency	33 (23.4)
Duration of surgery(mins ± SD)	85.74 ± 22.78

Key: ASA - American Society of Anesthesiologists, SD - Standard Deviation

Table 2: Anaesthetic Techniques and Outcome

Type	Number (%)	Use of Sedation	Conversion to GA	Day-case	Admitted
LA	48(34.1)	40 (59.7)	2 (33.3)	40(75.5)	8(9.1)
SA	67(47.5)	27 (40.3)	4 (66.7)	11(20.8)	56(63.6)
GA	26(18.4)	-	-	2(3.8)	24(27.3)
Total	141	67	6	53	88

Key: LA- local anaesthesia, SA- spinal anaesthesia, GA- general anaesthesia

Majority of the patients treated were treated as in-patients(88; 62.4%) while 53(37.6%) were treated as day cases. Forty (84.6%) of patients in the LA group were treated as day cases compared to SA (11; 16.8%) and GA (2; 7.6%).

DISCUSSION

Inguinal hernia repair is the commonest surgery performed by general surgeons.^{4,6} Our study showed that majority of the hernias occurred in males (83.7%) as against females (16.3%). This agrees with findings by previous researchers.^{2,4,5,6} who observed male

preponderance of hernias. This is probably due to strenuous physical exertion, weight lifting, and smoking which is commoner in males.^{3,6} Unilateral hernias have been reported in most studies^{3,6} to be higher than bilateral hernias. This was also the observation in our study where unilateral hernias accounted for about 87.2% of the cases. Also, fewer patients (38.3%) in our study had non-tension mesh repair as against the open repair with nylon. This is in keeping with many Nigerian studies (2,6). Awe *et al.*⁶ suggested non-availability and cost of the mesh to be responsible for this low usage. In our centre, the use of tension-free mesh repair has increased due

Spinal anaesthesia on the other hand, has been documented to have no benefit for this minor operation and should be avoided owing to the risk of rare neurologic side effects and the high risk of urinary retention.⁸ General anaesthesia with short-acting agents may be a valid alternative when combined with local infiltration anaesthesia. Surprisingly, despite sufficient scientific data to support the choice of anaesthesia, some studies^{4,6} still show undesirable high use of spinal anaesthesia over local anaesthesia. This study aims to evaluate anaesthesia practice for inguinal hernia in our centre. The study seeks to compare the safety profile of the different techniques of anaesthesia for inguinal hernia repair and the degree to which each technique was used during the period under review

PATIENTS AND METHODS

This was a retrospective study of all cases of inguinal hernia repairs performed from January 2011 to December 2013. Patients who had inguinal hernia with other surgical pathologies performed at the same time were excluded. Information was obtained from anaesthetic charts, theatre and ward registers. Relevant data extracted included: age, sex, American society of anaesthesiologists (ASA) physical health status, type of anaesthesia, complications and day-case status. Based on the type of anaesthesia performed, patients were categorized into three groups namely: Local anaesthesia (LA), Spinal anaesthesia (SA) and General anaesthesia (GA). Those who were treated with LA and SA were further classified as those requiring sedation or no sedation, and those converted to general anaesthesia or not converted. Sedation was defined as those who received 10-20mg of ketamine aliquots, pentazocine 30mg and diazepam 5-10mg, while conversion to general anaesthesia was defined as those requiring continuous inhalational anaesthetic agent or anaesthetic doses of intravenous agents for maintenance of anaesthesia; with or without endotracheal intubation. The findings were reported using mean, relative frequency distribution, group percentages, tables and charts.

RESULTS

During the period under review (January 2011-December 2013), 141 patients with inguinal hernia had herniorrhaphy. The male patients were

118(83.7%) and females 23(16.3%), representing a male to female ratio of 5.1:1 (Table 1). The mean age at presentation was 44 years with a range of 18-77 years. Majority of the patients belonged to the American Society of Anesthesiologist (ASA) physical status class I (80; 56.4%), while those in class II, III and IV were 31(22.3%), 26(18.1%) and 4(3.2%) respectively (Table 1). Fewer patients presented as emergencies 33(23.4%) compared to elective 108(76.6%). Regarding site (Table 1), 123(87.6%) of the patients had unilateral hernia while only 18(12.8%) presented with bilateral hernias. A total of 87(61.7%) patients had a non-mesh repair with nylon, while 54(38.3%) patients were treated with non-tension mesh repair (Figure 1).

Spinal anaesthesia (67; 47.5%) was the dominant anaesthetic technique, followed by local anaesthesia (48; 34.1%) and general anaesthesia (26; 18.4%) (Table 2). Sixty-seven patients from the LA and SA groups received sedation. Of this number, 40(59.7%) belonged to the LA group and 27(40.3%) belonged to the SA group. Only six patients in the LA and SA groups were converted to GA, out of which two were in LA group. The reasons for conversion to GA were mainly failed spinal and prolonged surgery. The mean duration of surgery was 85.74 minutes with a range of 50-175 ± 22.78 mins.

Common complications observed in this study were hypotension, bradycardia, tachycardia and hypertension. Hypotension and bradycardia occurred mainly in the SA group and were treated with ephedrine and atropine respectively, while tachycardia and hypertension did not require treatment. No complication was observed in the GA group. Mortality was not recorded in any group.

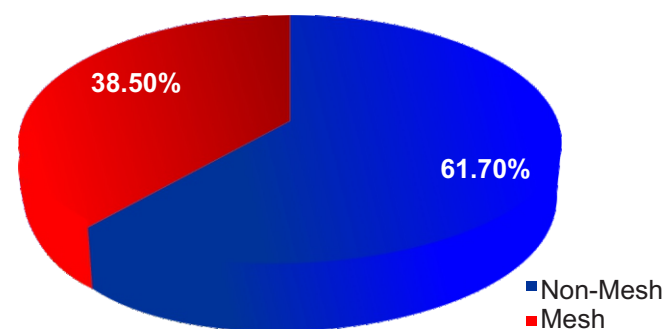


Figure 1: Pie Chart Showing Method of Repair

were kept under the care of a trained animal technician and cared for according to Canadian council on animal care: guide to care and use of experimental animals.⁹ Animals were allowed free access to water and chow over a two weeks adaptation period and closely monitored.

Experimental Design and Induction of Experimental Diabetes Mellitus

The design consisted of fifty (50) female rats divided into 4 groups of diabetic and 1 group of normal rats with 10 animals in each group. Diabetes mellitus were induced in the diabetic groups after and overnight fast by intraperitoneal injection of 55mg/kg body weight of Streptozotocin, (STZ) (Sigma St. Louis, MO, USA) reconstituted in 0.1% M sodium citrate buffer. Rats whose fasting blood glucose concentration were higher or equal to 200 mg/dl three days after the induction were confirmed diabetic and recruited in the study. Blood glucose concentration was determined using one touch Glucometer (Lifescan, Inc. 1995, Milpas, California, U.S.A) with blood obtained from the tail vein of the rats.

Group I (normal control, NC) was fed with control diet; Group II (diabetic control, DC) was fed with control diet Group III (diabetic treated 5%, 5%VA) was fed with 5% *Vernonia amygdalina* (VA) diet. Group IV (diabetic treated 7.5%, 7.5%VA) was fed with 7.5% *Vernonia amygdalina* (VA) diet. Group V (diabetic treated insulin, INSULIN) was fed with control diet and treated with insulin, a standard therapeutic agent, which was introduced for comparison. Insulin dose used was 5U/kg body weight (b.w), given subcutaneously (s.c) according to Sonia and Scrinvassan[10]. It was given once per day post prandial. Feed and water (Tap water) was given ad-libitum. Treatment lasted for 28 days

Collection of Sample for Analysis

At the end of the 28 days, food and water were withdrawn. The rats fasted overnight. They were then euthanized under chloroform vapor and sacrificed. Whole blood was collected via cardiac puncture using sterile syringes and needles into sterile tubes. Serum was separated for biochemical assays of alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP). The liver was surgically removed. It was immediately washed with physiological saline and then weighed with

an analytical balance. It was collected into paper bag and stored frozen until needed for tissue homogenate preparation. Tissue homogenate was prepared in 0.1M Tris-HCl buffer (pH 7.4) and used for the determination of MDA, and activities of glutathione peroxidase (GPx), catalase (CAT) and superoxide dismutase (SOD).

Biochemical Assays

Serum Biochemical Assays

Serum was used for biochemical assay of alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ALP) using Biosystem diagnostic kits (Barcelona, Spain). Tissue homogenate was used for the quantitation of lipid peroxidation by the method of Ohkawa *et al.* [11]. Glutathione peroxidase (GPx): GPx estimation was done by the method of Paglia [12]. Catalase (CAT): CAT activity was measured by Takahara *et al.*¹³ Superoxide dismutase (SOD): Superoxide dismutase was measured as described by Misra.¹⁴

Statistical Analysis

The results were analyzed for statistical significance by one-way ANOVA using the SPSS statistical program and least square test (LSD) between group using MS excel programme. All data were expressed as mean + SEM. P value <0.05 was considered significant.

RESULTS

The effect of consumption of diet containing *Vernonia amygdalina* on the activities of glutathione peroxidase (GPx), superoxide dismutase (SOD) and catalase (CAT) and on the concentration of malondialdehyde (MDA) of diabetic rats is shown in Table 2. Rats in the diabetic control group had GPx, SOD and catalase activities that were significantly lower ($P < 0.05$) (125 ± 1.52 , 45.16 ± 1.66 , and 7.68 ± 0.12 nmole/min/mg protein respectively) compared to those of the normal control (180 ± 2.55 , 140.44 ± 1.42 , 11.24 ± 0.09 nmole/min/mg protein respectively). MDA concentration was significantly higher ($P < 0.05$) for the diabetic control (39.05 ± 0.49 nmole/g protein) compared to the normal control (26.62 ± 0.35 nmole/mg protein). Treatment with diets of the *Vernonia amygdalina* significantly increased ($P < 0.05$) the GPx, SOD and the catalase activity but significantly reduced ($P < 0.05$) the MDA concentration in the diet treated groups compared

Table 1: Percentage Composition of Experimental Diets

Feed ingredient Diets	Control	VA - 5%	VA - 7.5%
Soybean meal(%)	33.78	31.03	30.53
Garri(%)	26	25	25
Maize meal(%)	38	37	35
L- Lysine(%)	0.18	0.18	0.18
L- Methionine(%)	0.17	0.17	0.17
Min/ vitamin(%)	0.25	0.25	0.25
DCP(%)	2.00	2.00	2.00
Bone meal(%)	1.00	1.00	1.00
Corn oil(%)	0.25	0.25	0.25
V. amygdalina(%)	-	5	7.5
Nutrient analysis:			
CP(%)	18.40	18.31	18.47
CFAT(%)	4.30	4.01	3.97
CFIBRE(%)	3.71	4.27	
ME(kcal/kg)	3219	3214	3213

Key: VA - *Vernonia amygdalina*

Composition of premix: (nutrient in Amount of 2.5kg)Vit A (I.U) 12,000,000,vit D₃(U) 2,500,000, Vit E(mg) 20,000,vit K₃(mg)2,000,vit B1 (mg) 2,000,vit B1 (mg) 5,000,Vit B6(mg) 4,000,vit B12 (mg) 15,niacin(mg) 30,000,Pantotheic acid (mg) 11,000,Folic acid(mg) 1,500,Biotin (mg) 60,Choline chloride(mg) 220,000,Antioxidant (mg) 1,250,Manganase (mg) 50,000, Zinc (mg) 40,000, Iron (mg) 20,000,Copper,(mg) 3,000,Iodine (mg) 1,000,Selenium (mg) 200,Cobalt(mg) 200(Manufactured by Megabiotics Nigeria LTD).

Table 2: Effect of Consumption of *Vernonia amygdalina* leaf diet on oxidative stress indices of diabetic rats

Treatment (Group)	MDA (nmole/mg protein)	SOD(nmole/min/mg protein)	GPx(nmole/min/mg protein)	CAT (nmole/min/mg protein)
NC (I)	26.62 ±0.35 ^a	140.44 ±1.42 ^a	180 ±2.55 ^a	11.24 ±0.09 ^a
DC (II)	39.05±0.49 ^b	45.16±1.66 ^b	125 ±1.52 ^b	7.68 ±0.12 ^b
5%VA (III)	15.58 ±0.82 ^c	140 ±5.12 ^a	140 ±0.00 ^c	12.44 ±0.07 ^a
7.5%VA (IV)	13.59 ±0.27 ^c	155 ±3.62 ^a	160 ±2.59 ^a	11.83±0.03 ^a
INSULIN (V)	14.20 ±0.39 ^c	104 ±4.31 ^a	142 ±1.86 ^c	11.47 ±0.11 ^c

^{a,b,c} Means within the same column with different superscript are significantly different (P<0.05)

Key: MDA- malondialdehyde; SOP - superoxide dismutase; Gpx - glutathione peroxidase; CAT- catalase; NC- normal control; DC- diabetic control; VA - *Vernonia amygdalina*

Table 3: Effect of *Vernonia amygdalina* leaf diet on STZ liver damage

Treatment (Group)	AST (U/L)	ALT (U/L)	AST/ALT	ALP (U/L)
NC (I)	1.68 ±0.21 ^a	4.73 ±0.22 ^a	0.35 ±0.01 ^a	33.68 ±0.39 ^a
DC (II)	13.17 ±2.17 ^b	8.70±2.28 ^b	1.51 ±1.10 ^b	63.01 ±1.69 ^b
5%VA (III)	3.97 ±0.65 ^c	4.65 ±13.35 ^a	0.86 ±0.04 ^c	38.83 ±2.03 ^a
7.5%VA (IV)	5.68 ±0.68 ^c	6.39 ±4.85 ^c	0.90 ±0.00 ^c	40.04±1.0 ^a
INSULIN (V)	4.12 ±10.29 ^c	8.98 ±15.69 ^b	0.45 ±0.71 ^a	44.90 ±1.29 ^a

^{a,b,c} Means within the same column with different superscript are significantly different (P<0.05)

Anaesthesia for Inguinal Hernia Repair: A Review of Practice at the University of Uyo Teaching Hospital, Uyo, Akwa Ibom State

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ABSTRACT

Elective surgical repair of an inguinal hernia is one of the common surgical procedures. Local, regional and general Anaesthesia are all used for hernia repair, but to different degrees depending on some factors. We reviewed Anaesthesia practice for inguinal hernia repair in our centre. The study seeks to compare the safety profiles of the different techniques of Anaesthesia for inguinal hernia repair and the degree to which each technique was used during the period under review. This was a retrospective study of all inguinal hernia repairs performed from January 2011 to December 2013. Data were obtained from Anaesthetic chart, theatre and ward registers. Information collected were as follows: age, sex, ASA physical status, type of hernia, type of repair, type of Anaesthesia, use of sedation, conversion to general Anaesthesia, complications and whether the patient was admitted or treated as a day case. One hundred and forty one hernia repairs were performed. Spinal Anaesthesia was the dominant Anaesthetic technique (47.5%), followed by local Anaesthesia (34.1%), and general Anaesthesia (18.4%). Of those who received either local or spinal Anaesthesia the use of sedation was higher in the local Anaesthesia group (84.7% vs 41.6%), whereas more patients in the spinal group were converted to general Anaesthesia compared to local Anaesthesia group (66.6% vs 33.3%). Spinal Anaesthesia was associated with more Anaesthetic complications compared to local and general Anaesthesia. Day case rate was higher in the local Anaesthesia group (84.6%) compared to spinal (16.8) and general (7.2%) groups. The study revealed that local Anaesthesia is the safest technique of Anaesthesia when compared to spinal and general Anaesthesia, but its practice is rather low. We therefore recommend a greater use of local Anaesthesia for inguinal hernia repair.

Keywords: Anaesthesia, Hernia Repair, Day-Case

INTRODUCTION

Inguinal Hernia repair is the commonest operation performed by general surgeons worldwide.¹ In the United Kingdom and USA, the annual rate of herniorrhaphy is 10-25 per 1000 population.² It is a common indication for surgery in Africa.¹ Though the incidence and prevalence of this condition in Nigeria are not known³, however, it is one of the most common problems presenting to the surgeons. In a surgical outreach in Ogoja, Nigeria, Ilori documented that hernia was the most common pathology in both adults and children, accounting for about 67% of the surgeries performed.⁴ Similarly, in a 14-year review of a secondary level surgical practice in Nigeria, external hernia repair constituted 56.1% of the surgical procedures undertaken.⁵ Certain factors have been implicated in the aetiology of primary inguinal hernia. These include the

presence of patent processus vaginalis, physical exertion, weight lifting, constipation, straining during urination, obesity, ageing, and a positive family history.³ Ashindoitang and colleagues investigated risk factors for inguinal hernia in 404 adult male Nigerians and found positive family history and strenuous work to be significant risk factors for developing hernias.³

Surgical repair of inguinal hernia either by the open or laparoscopic methods is usually advocated for treatment of symptomatic hernias or to prevent complications.⁶ However, this treatment presents several challenges regarding anaesthesia for the procedure. Local, general and regional anaesthesia are all used for hernia repair, but to different degrees primarily depending on traditions and whether the institution has specific interests in hernia surgery.⁷ Existing data from large consecutive patient series and randomized studies have shown local anaesthesia to be the method of choice because it can be performed by the surgeons, does not necessarily require an attending anaesthesiologist, translates into the shortest recovery (bypassing the post anaesthesia care unit), has the lowest cost and the lowest post operative morbidity regarding risk of urinary retention.⁸

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to the diabetic control. The impacts of dietary treatment at the two inclusion levels on these markers of oxidative stress were not significantly different ($P < 0.05$) compared to insulin. Table 3 shows that the AST, ALT and ALP level of the diabetic control were significantly increased ($P < 0.05$) in the diabetic control group compared to the normal control. Treatment with the diet and insulin significantly reduced ($P < 0.05$) their levels compared the diabetic control. Results for diets were superior to insulin.

DISCUSSION

The research was design to evaluate the potential role of diets containing *Vernonia amygdalina* leaves in the management of oxidative stress and liver damage in diabetics, with the view to expand treatment option and accessibility to medicaments. Streptozotocin induced a type 1 model of diabetes. There was a profound alteration in the level of lipid peroxidation end product (MDA) content and antioxidant enzyme status in the liver. MDA level was significantly ($P < 0.05$) elevated whereas the enzymes level were significantly reduced ($P < 0.05$). Elevated lipid peroxidation and the drastic alterations in the antioxidant enzyme status is an indication of oxidative stress in the liver of the diabetic control rats. The diabetic rats treated with diets exhibited considerable protection against the oxidative stress at both dose levels though; the higher dose level was numerically superior. The GPx, SOD and CAT level were significantly increased while MDA was significantly reduced in the diabetic treated group compared to the diabetic control. This shows the protective effect of the diet on the antioxidant enzyme status of diabetic rats.

The ASP, ALT and ALP level support the fact that the diet played a protective role since their levels were significantly reduced ($P < 0.05$) in the groups of diabetic rats consuming the diets compared to the diabetic control as opposed to the increased in their levels in the diabetic control. The liver is the major organ involved in glucose homeostasis. Hepatocellular injury, cell death and liver fibrosis occur when ROS and RNS are generated in excess¹⁵ Glutathione peroxidase is important in cellular defense against wide variety of hydroperoxides.¹⁶ The liver is abundant in both selenium dependent and independent GSH-Px. The enzyme is found in the cytoplasm, mitochondria, and nucleus and metabolizes

hydrogen peroxide to water by using reduced glutathione as a hydrogen donor. There is no agreement about the effects of diabetes on the activities of glutathione peroxidase in the liver. Maritime¹⁷ reported elevation of its activity in the liver while Rajasekaran and Kalaichavan¹⁸ reported a decrease in its activity in the liver. In our study, we obtained a decrease in its activity and our results agree with Rajasekaran and Kalaichavan.¹⁸ The discrepancy may be due to the severity and duration of diabetes and the time the sample were collected. Some animals might have on their own managed to recover from the diabetogen before the samples were collected. Reduction in the activity of this enzyme may compromise its function and might account in part for the increased oxidative stress in the diabetic control in this study. Diabetes-induced alterations in glutathione peroxidase activity are reversed by treatment with probucol, DHEA, combined vitamins C, E, and -carotene, quercetin (in liver and brain, though not in kidney or heart), coenzyme Q10 and isoeugenol (only in liver), piperine (in kidney GPx).¹⁷ The diet in this study was effective in restoring the activity of this enzyme.

SOD converts superoxide anion radicals produced in the body to hydrogen peroxide, thereby reducing the likelihood of superoxide anion interacting with nitric oxide to form reactive peroxynitrite. There is no consensus on the effect of diabetes on the activity of SOD in the liver¹⁷ which perhaps is due to the same reason advanced for GPx activity. In our study, we obtained decrease in the activity of this enzyme in the liver of diabetic control rats and our results agree with Rajasekaran and Kalaichavan.¹⁸ Reduction in the activity of SOD may compromise its function and might account in part for the increased oxidative stress in the diabetic control in this study. Alterations of SOD activity in well established diabetes was possible with coenzyme Q10 and piperine, but not with vitamin C, vitamin E, and carotene.¹⁸ Reports show that conventional antioxidants do not prevent diabetic complications effectively (especially in sustained hyperglycemia) because conventional antioxidants neutralize reactive oxygen molecules on a one-for-one basis, whereas hyperglycemia-induced overproduction of superoxide is a continuous process. The diet in this study was effective in restoring the activity of this enzyme. Diet high in vegetables and fruits are

more beneficial than conventional antioxidants since they contain plethora of antioxidants and other significant dietary factors. *Vernonia amygdalina* leaf is rich in antioxidant vitamins, minerals, cofactors and phytochemical.¹⁹ They work in synergy with each other and against different types of free radicals.¹⁷

There is also no consensus view on the effect of diabetes on the activity of catalase, which perhaps is due to the same reason advanced for GPx activity. In our study, we obtained decrease in the activity of this enzyme in the liver of diabetic control rats and our result agrees with Rajasekaran and Kalaichavan.¹⁸ Catalase decomposes hydrogen peroxide to water and oxygen. Reduction in its activity may compromise its function and might account in part for the increased oxidative stress in the diabetic control in this study. Treatment of established diabetes of 4 weeks or more did not alter its level. For example, no reversals are seen after treatment with melatonin, quercetin, coenzyme Q10, piperine, isoeugenol, gemfibrozil, or combined vitamin C, vitamin E, and beta-carotene.¹⁷ It was interesting to observe that our diet was able to elevate the activity of this enzyme to normal.

The increased MDA level in the liver of diabetic control rats was an indication of hyperglycemia caused lipid peroxidation. MDA is more cytotoxic and stable than reactive oxygen species.²⁰ The increase in lipid peroxidation is also an indication of decline in defence mechanisms of enzymatic and nonenzymatic antioxidants. Oxidized lipids are able to produce MDA as a decomposition product and the mechanism is thought to involve formation of prostaglandins, like endoperoxides, from polyunsaturated fatty acid (PUFA) with two or more double bonds]. Increased lipid peroxidation in the membrane of liver²¹ is reported in diabetic cases. Increased level of MDA in diabetics suggests that peroxidative injury may be involved in the development of diabetic complications and is associated with vascular complications²¹. Increase in lipid peroxidation results in tissue damage.²¹ Liver damage is followed by leakage of liver enzymes ASP, ALT and ALP. Significant high levels of these enzymes were seen. Reduction in the level of these enzymes in the diabetic rats consuming diet showed that the diet was able to counteract lipid peroxidation and perhaps heal the damaged cells. Similar observations were reported for

Azadirachta indica leaf extract.²²

CONCLUSION

The presents study demonstrates the potential role of *Vernonia amygdalina* leaf diet in protect ingoxidative stress and liver damage in diabetic wistar rats. The effect of the diet may be due to the plethora of antioxidants in the leaves including vitamins, minerals, cofactors, and phytochemicals acting in synergy against all oxidants and also containing compounds acting as insulin as well as antioxidant enzymes mimics. The diet may play a major role in protecting oxidative stress and liver damage of diabetes mellitus and is therefore recommended for further studies.

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up, if need be. This finding is somewhat comparable to the results obtained by other researchers in many other countries; in Australia the rate of counselling, education or advice documented by general practitioners was 33 per 100 STI contacts²³; and in Uganda, while 29% gave complete education and counselling, 61% mentioned the need to help their partners get treatment³³, but in Malaysia 84.6% requested their partners to be notified³², however fewer 13 (56.4%) respondents in the Uyo study included partner notification in their counselling message to the patients. Methodological variations may have accounted for the differences observed, the main limitation in the Uyo study being that it was strictly based on what the clinicians reported, there was neither observation of clinician-patient interaction, nor review of the health records to substantiate the claims that were reported.

It was therefore concluded that most clinicians in Uyo do not manage STIs effectively, as complete patient education and counselling which is a very important component of STI management was not offered by most of them. This calls for skills reinforcement in STI management, aimed at promoting the use of the proven cost-effective but comprehensive STI management tool which readily reminds the clinician of all the steps to take in managing STI patients. This can be done through CME and other similar update programs, for clinicians in Akwa Ibom State.

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