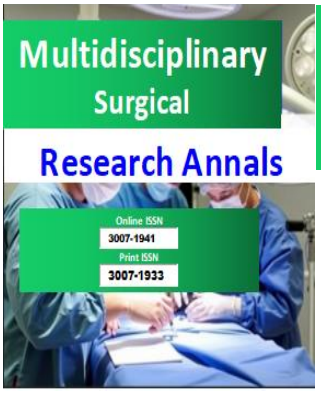

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Epideomology And Risk Factor Of Soil Transmitted Helminths In Children And Adults In Distrct Mardan

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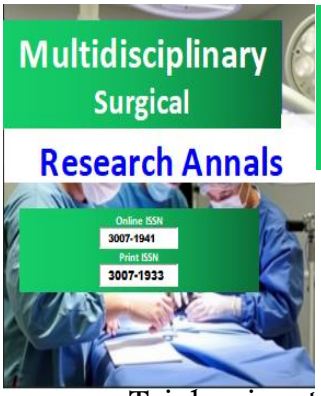
Abstract

Soil-transmitted helminths (STHs), including Ascaris lumbricoides,



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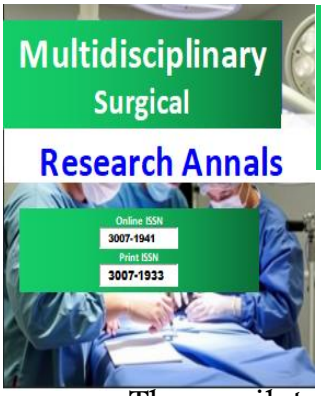
Trichuris trichiura, and Ancylostoma duodenale, are parasitic nematodes that infect humans through contaminated soil. Poor sanitation and lack of clean water contribute to infections, which can impair immunity, cause anemia, and hinder physical and cognitive development, especially in children. To determine the prevalence of STH infections in children and adults in Mardan and identify associated risk factors. A total of 600 fecal samples (300 from children, 300 from adults) were collected through convenience sampling and analyzed for helminth eggs/larvae using direct wet mount, flotation, sedimentation, and modified formal-ether sedimentation techniques. A total of 600 patients were examined for soil transmitted helminthes. Out of 600 patients, 300 stool samples were collected children's while 300 from adults. Out of 300 stool samples of children, one hundred and twenty nine (129/300, 43%) children were found positive for soil-transmitted helminthes. Out of 129 fecal samples from children, the highest prevalence of Ascaris lumbricoides (92/129, 30%) followed by Trichuris trichura (24/129, 8%) while lowest prevalence of Ancylostoma duedenale (13/129,4%) was observed. In adults 152 out of 300 samples were found positive where the highest species wise prevalence of Ascaris lumbricoides (Ascaris)(110/152, 36%), was recorded followed by Trichuris trichura(whipworms) (35/152 ,11%) while the lowest Ancylostoma duedenale (hookworms) (13/152, 4%)) was observed respectivel. STH infections remain a significant public health concern. Large-scale deworming, improved hygiene practices, and school-based interventions are essential for effective control and prevention.

Key words: Diarrhoea, Trophozoites, Prevalence, Endoparasites, trophozoite, Smear, Ascaris lumbricoides, Trichuris trichiura, hookworm.

Introduction



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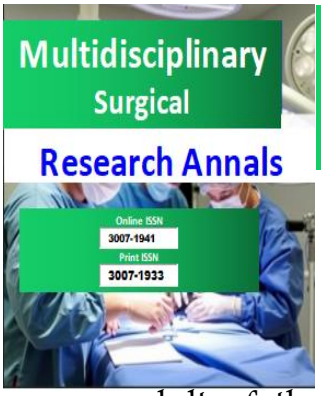
The soil-transmitted helminths comprised Ascaris lumbricoides (roundworms), Trichuris trichiura (whipworms), and Necator americanus or Ancylostoma duodenale (hookworms) are group of parasitic nematodes which cause infections in the human. A. lumbricoides and T. trichiura are transmitted by eggs while hookworms through larvae found in faecally contaminated soil (1).The soil-transmitted helminths (STHs) are infect people, often found in inadequate sanitation and insufficient access to clean water. Additionally STHs infections impair immunological function, increasing the risk of other illnesses in children and delaying their physical and intellectual development (2). By attaching to the intestinal wall and consuming blood of their host induce anaemia. This causes persistent blood loss, which causes anaemia and iron deficiency (3). It is estimated that A.lumbricoides infect 1.47 billion people are infected, 1.3 billion with N.americanus/ A.duodenale and 1.5 billion with T.trichura. School-age children are disproportionately affected by helminths infections through the soil (4). Ascaris lumbricoides (roundworm) can frequently affect with pre-schoolers, students, and adolescents (5). The female worms of the Ascaris lay their eggs in the small intestinal lumen, where they are excreted alongside the host's waste (6). They result in vomiting, reduced appetite, nausea, gastric pain, malaise, pale, foul-smelling, oily stools, diarrhoea, and weight loss (7).

The human whipworm or Trichiura trichiura, is a round worm that affects the large intestine of people (8). The term "whipworm" refers to the worm's whip-mean wider body shape "handles" in the end back (9). They enter the body of host by mean of anterior end feeding in the cell or tissue. After entering the intestinal mucosa through burrowing, the worm produces ulcers, mucosal bleeding (10). The upper portion of human small intestine are parasitized by hookworms



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adult of the genera Ancylostoma and Necator. They penetration the skin,and access the afferent circulation of host's by moving into lymphatic vessels and subcutaneous venues (11). The larvae eventually move through the gastrointestinal tract, pass through the epiglottis, enter the lungs, and become imprisoned in pulmonary capillaries (12). In communities that are socioeconomically disadvantaged and have poor environmental sanitation, excessive population density, limited access clean water, and low educational levels, have a higher prevalence rate (13). Due to interaction with soil during daily activities. It has been repeatedly determined that soil-transmitted helminths cause significant risk to public health and come most prevalent (14).

Material And Method

Study Area

The study was carried out in District Mardan of Khyber Pakhtunkhwa. Mardan are situated at 34°12'0N, 72°1'60E, and 283 metres (928 feet) above sea level.

Collection Of Stool Sample And Ethical Approval

In a cross-sectional study, 600 stool sample (300 from children and 300 from adult) were collected randomly from school children ,from August 2022 to August 2023. Biodata of student such as name,age and sex etc were recorded in a questionnaire.

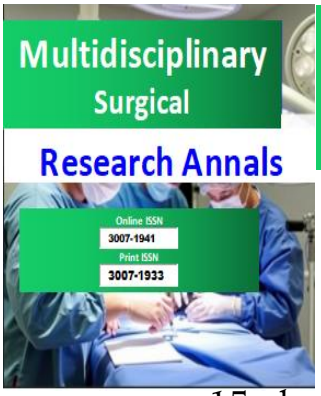
Processing Og Fecal Analysis

Each of the stool samples were processed by: Direct smear method (normal saline solution) and formalin-ethyl acetate sedimentation technique for examination of parasite (STHs) .

Sample Analysis

1) Sedimentation Method

This technique was used for the identification of nematodes parasites. In this technique we took 5ml of fecal sample filter through gauze piece



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over 15ml centrifuge tube and add 10 % formalin to bring the volume of centrifuge tube. The centrifuge was run 500 rpm for 10 minutes. After decant the top layer, add 10% formalin in tube. Then added 4ml of ethyl-acetate, stopped the tube shaking and kept the tube inverted for 30 seconds. Then again top layer was decanted. After that few drops of 10 % formalin was added to re-suspend. Then examined under microscope for parasits.

2) Flotation Method

This technique was also used for the identification of nematode parasites. Add 10% formalin and 4 ml ethyl-acetate, to fecal sample and centrifuge it for 500 rpm for 10 minutes. Took a top layer in a slide and examined under the microscope.

Microscopic Examination

Light microscope was used to view and diagnose the soil transmitted helminths. All the fecal samples were processed through centrifugation.

Statistical Analysis

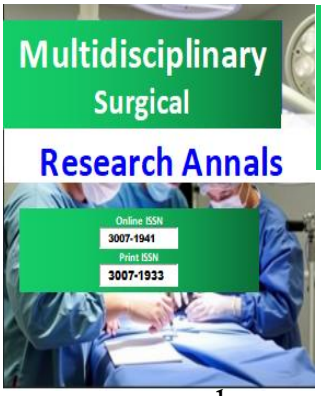
Sample was analyzed by using two way ANOVA to compare the selected variables among different age groups using the statistical package SPSS-28. Graph Pad Prism 9.0 was used to illustrate the concepts in graphical form of significant and non-significant values.

Results

During the present study, stool samples were randomly collected from adults and children in District Mardan. All the samples were processed by formal ether sedimentation technique and were screened microscopically for STHs.

Age Wise Prevalence In Children

Table 1 represents different age groups of children such as >1 years, 1-2 years, 2-3 years and 3-5 years . In this study prevalence of different species of various soil transmitted helminths were studied. The highest



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prevalence of Ascaris lumbricoides was (33.61%) observed at the age of 3-5 years followed by (30 %) prevalence at the age of 1-3 years while the lowest prevalence (26.6 %) was observed at the age of < 1 year.

Similarly the highest prevalence of T.trichura (11.4%) was observed at the age of > 1 year, followed by (8.4 %) prevalence in 1-3 years, while the lowest prevalence (5 %) was observed at the age of 3-5 years. The highest prevalence of hook worms was observed at the age of 1-3 years (5.1%), followed by (4.3%) prevalence at the age of < than 1 year while lowest prevalence (3.9 %) was observed at the age of 3-5 years.

Table 1. Age wise Prevalence of soil-transmitted helminths in children

Parasite	Ages	Total no of sample	Positive sample	Prevalence (%)	P-value
Ascarislumbricoides (Roundworm)	Less than 1 year	125	36	26.6%	P>0.7304
	Age 1-3 years	80	24	30%	
	Age 3-5 years	95	32	33.6%	
Trichuris trichura (Whip-worm)	Less than 1 year	87	10	11.4%	P>0.6266
	Age 1-3 years	95	8	8.4%	
	Age 3-5 years	118	6	5%	
Ancylostomaduoden	Less	69	3	4.3%	

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ale (Hookworm)	than 1 year				P>0.9133
	Age 1-3 years	78	4	5.1%	
	Age 3-5 years	153	6	3.9%	

Fig.4 Represent comparative analysis of different age group in children

Sex-Wise Prevalence In Children

During this study 300 fecal samples were collected from children. Out of 150 male, only 72 were positive for the STHs infection where the prevalence was (48 %), while in female out of 150 samples, only 57 were positive and the prevalence was (38 %). Statistically non-significant difference (P >0.1029) was observed among different age groups.

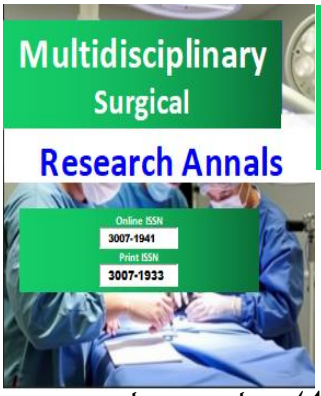
Table 2: Sex-Wise Prevalence In Children

Sex	No of samples	Positive samples	Prevalence %	P- value
Male	150	72	48%	
Female	150	57	38%	P>0.1029
Total samples	300			

Fig.5 Represent Analysis Of Sex Wise Study In Children

Effect Of Drinking Water, Area And Contact With Animals On Prevalence Of Sths In Children

During this study different risk factors such as water sources, area, animal contacts and soil contact was also studied. The highest prevalence was (53.8%) in river water, followed by well water (15.2%),



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tap water (4.44 %) while the lowest prevalence was observed in filter water (1.25%). Area wise prevalence showed the highest prevalence in rural area (80.3%), followed by urban area (60%). The highest prevalence was observed in individuals those have animal contact (44.6%), and those who have no contact with animal (11.4%). The highest prevalence was observed in those individuals who have soil contact (83.6%) than those having less or no soil contact (6.66%).

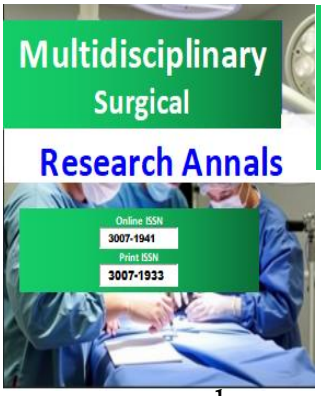
Table 3: Risk Factors That Contribute To STHs Transmission In Children

Risk factor	Variable	No. of sample	Positive sample	Prevalence (%)	P-value
Main water source at home	Tap	135	6	4.44%	P< 0.001
	Well	72	11	15.27%	
	River	13	7	53.84%	
	Filtered water	80	1	1.25%	
Area	Urban	86	52	60.4%	P< 0003
	Rural	214	172	80.3%	
Contact with animal	Yes	195	87	44.6%	P<0.0001
	No	105	12	11.4%	
Contact with soil	Yes	226	189	83.6%	P<0.0001
	No	74	5	6.66%	

Fig.6 Represent Prevelence Of Sths Egg In Different Water Source

Age Wise Prevalence In Adults

A total of about 300 fecal samples were collected from different age groups of adult such as 10-15 years, 16-20 years, 21-25 years, and 26-30 years. The highest prevalence of Ascaris lumbricoide was (48.3 %)



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was observed at the age of 21-25 years, followed by (32.8 %) prevalence at the age of 10-15 years while the lowest prevalence (29.2 %) was observed at the age of 16-20 years. Similarly the highest prevalence of T.trichura (13.1 %) was observed at the age of 21-25 years, followed by (12.1 %) prevalence 10-15 years, while the lowest prevalence (7.5 %) was observed at the age of 16-20 years. The highest prevalence of hook worm was observed at the age of 10-15 years (9.5 %) followed by (4.3%) prevalence at the age of 21-25 years while the lowest prevalence (2.9 %) was observed at the age of 16-20 years.

Table 4: Age Wise Prevalence Of Soil-Transmitted Helminths In Adults

Parasites/Species	Ages	Total no of samples examined	Positive samples	Prevalence (%)	P-value
Ascaris lumbricoides (Roundworm)	Age 10-15years	146	48	32.8%	P>0.02
	Age16-20years	65	19	29.2%	18
	Age21-25 years	89	43	48.3%	
Trichuris trichura (Whip worm)	Age 10-15years	148	18	12.1%	P>
	Age16-20years	53	4	7.5%	0.572
	Age21-25years	99	13	13.1%	
Ancylostoma duodenale	Age 10-15years	42	4	9.5%	

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(Hookworm)	Age16-20years	167	5	2.9%	P>0.1779
	Age21-25 years	91	4	4.3%	

Fig 7. Represent Analysis Of Different Age Group In Adults

Sex-Wise Prevalence Of Sths In Adults

A total of 300 stool samples were collected. Out of 150 samples from male, only 89 were positive for STHs while in female only 69 were positive out of 150 stool samples. In male and female the prevalence ratio was (59.3 %) and (46 %) respectively.

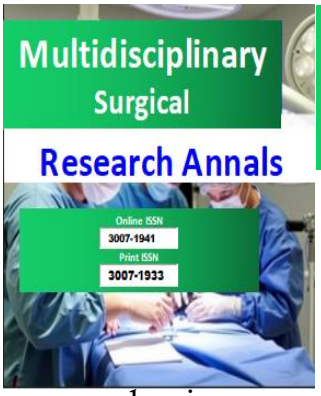
Table 5: Sex-Wise Prevalence Of Sths In Adults

Variable (sex)	No of sample	Positive sample	Prevalence (%)	P-value
Male	150	89	59.3%	P>0.063
Female	150	69	46%	
Total samples	300			

Fig 8. Analysis Of Sex Wise Prevalence In Adult

Risk Factors Of Sths Transmission In Adults

During this study different risk factors such as water sources, area, animal contacts and soil contact were studied. The highest prevalence was (33.3%) in river water, well water (12.5%), tap water (5.10%) while the lowest prevalence was observed in filter water (2.2%). Area wise prevalence showed the highest prevalence in rural area (75.7%) followed by urban area (67%). The highest prevalence was observed in those individuals those have animal contact (50%) followed by those



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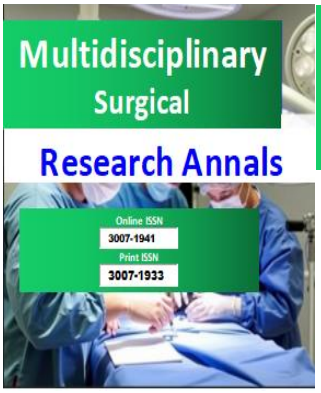
having no contact with animal (13.6%). The highest prevalence was observed in those individuals who have soil contact (89.1%).

Table 6: Risk Factors That Contribute To STHs Transmission In Adults

Risk factor	Variable	No.of samples	Positive samples	Prevalence (%)	P-value
Main water source at home	Tap	235	12	5.10%	P< 0.001
	Well	8	1	12.5%	
	River	12	4	33.3%	
	Filteredwater	45	1	2.22%	
Area	Urban	267	179	67%	P>0.311
	Rural	33	25	75.7%	
Contact with animal	Yes	278	139	50%	P<0.0010
	No	22	3	13.6%	
Contact with soil	Yes	83	74	89.1%	P<0.0001
	No	217	12	5.52%	

Discussion

The present study showed overall prevalence of soil transmitted helminths school going children and adults. An investigation the risk factor for transmission of (STHs) among children and adults. The prevalence of STHs were recorded in different age groups of children and adults where the prevalence of Ascaris species for less than 1 year of children were recorded (26.6 %), and for age 1 to 3 years prevalence rate were (30 %), and for age 3 to 5 years prevalence were recorded (33.6 %). The STHs prevalence rate of Ascaris was found in age less than 5 years were recorded (55.8%). Similarly the prevalence of whip



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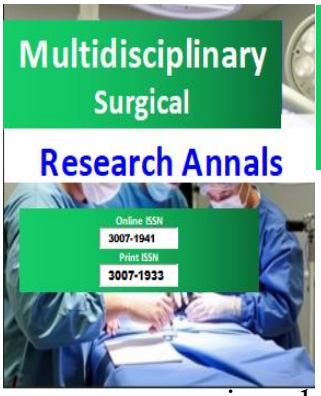
worms were observed in less than 1 year that (11.4%), in age 1 to 3 years the prevalence rate was (8.4%) and age 3 to 5 years have an observed prevalence (5 %) (15). The prevalence of whip worm recorded for less than 5 years were (19%). Similarly the prevalence of hook worms were also observed for less than 1 years were (4.3 %), age 1 to 3 years have prevalence rate (5.1 %), from age 3 to 5 years the prevalence were recorded (3.9 %) (16). The hookworm was reported in age less than 5 years were (5.99%) (17). In the present study the prevalence of STHs for both sexes were recorded and male has higher prevalence rate than female. He recorded that the prevalence of STHs in male were (44.1 %) while in females prevalence was (42 %) (18). The present study indicate that water sources play as a major transmitting agent for STHs. In the water sources the prevalence of tap water was recorded (4.44%), the prevalence of well was recorded (15.27%), the prevalence of river water was recorded (53.8%), and prevalence of filtered water was recorded (1.25%). They attributed that STHs are found in water due to poor treatment of water and poor hygiene. He recorded prevalence of STHs in river water were (47.3%) (19). Similarly the present study also recorded the prevalence of STHs in urban area. The prevalence rate were recorded in urban area was (60.4%), and the rural area was recorded (80.3%). The relatively low prevalence of STHs in urban area in (Mardan) region was attributed due to deworming program. The prevalence rate in contact with animal was (44.6%), and prevalence of contact with soil was (83.6%). The prevalence of STHs was dependent on age. Adults younger from 10 to 15 years the prevalence of Ascaris was recorded (32.8%), age 16 to 20 years prevalence rate was recorded (29.2%), age 21 to 25 years prevalence rate were recorded (48.3%). The 11 years and above adult in Iraq hospital recorded that Ascaris prevalence was (30.8 %) (20). He also recorded Ascaris in less than 25



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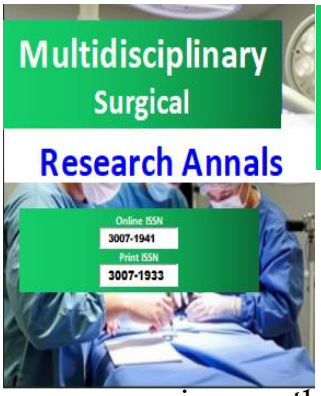
years in adult were almost (40%). Similarly the prevalence of whip worm were also recorded in age 10 to 15 years were (12.1%), and from 16 to 20 years age the prevalence were recorded (7.5%), and the prevalence of age 21 to 25 were recorded (13.1%) (21). The prevalence of whip worm in 15 years old adult and above were recorded (8%). Similarly prevalence of hook worm in age 10 to 15 years were observed (9.5%), 16 to 20 years old age prevalence were recorded (2.9%), and from age 21 to 25 prevalence were recorded from (4.3%) (22). The prevalence of hook worm in 25 years and below in his study was (3%). The study of adult also showed prevalence of male and female. The prevalence of male was also higher than female. The prevalence rate in male was (59.3 %) while in female it was (48.6%) (23). The male have slightly higher prevalence (44.1 %) than the females (42 %) (24). They also observed higher prevalence in males (39%) than females (32%) but also pointed out that infections are higher in male due to linked the everyday activities (25).

The present study in adult also indicated for the transmission of STHs risk factor contributed to main water source. the prevalence of tap water was (5.10%), followed by well water (12.5%), river water (33.3%) and filtered water (2.22%). The higher prevalence rate in river water (47.4%) (26). The current investigation found a statistically significant difference between the drinking water and the river water. Similarly the prevalence of area were also recorded. The prevalence rate in urban area (67%), while in rural area (75.7%). The highest prevalence was recorded in rural areas (27). The higher STHs (73%) in rural area highest due to hygiene measure (28). The prevalence rate in contact with animal was (50%) while contact with soil was (89.1%). In Iraq hospital he recorded prevalence rate in contact with soil was (49.1%) (29). As a result of their lack of hygiene knowledge, low immunity to



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various pathogens, low socioeconomic status, overcrowding, poor toilet training, and habit of playing everywhere, regardless how clean and dusty the play area is, younger adults generally have poorer hygiene habits. According to present studied showed that frequency of STHs parasites in low socioeconomic areas was high .

Conclusion

As long as in the developing world, soil-transmitted helminths infections in humans will continue to pose a threat to public health. The different organizations have taken action to provide anthelmintic medication in schools since they have recognized the negative effects of these illnesses on children's health and education. Deworming on a large scale required to lower the global morbidity. However, this strategy cannot be depended upon to reduce parasite frequency or infection without better sanitation . However, it is anticipated that the infrastructure set up for deworming kids in schools would make it easier to introduce new anthelmintic vaccines and other control measures.

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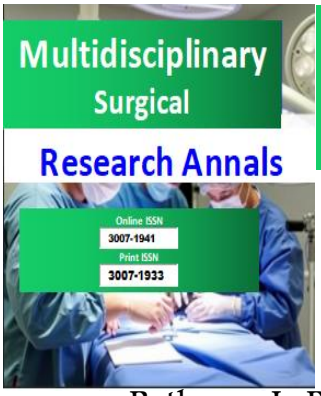

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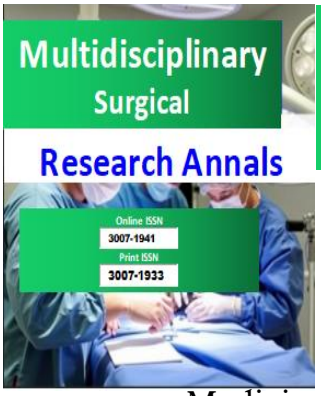

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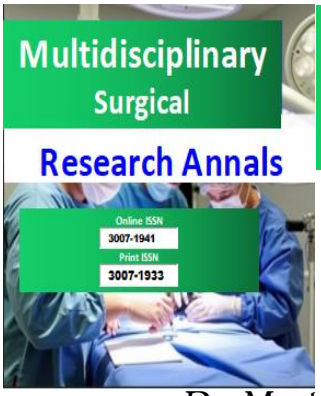

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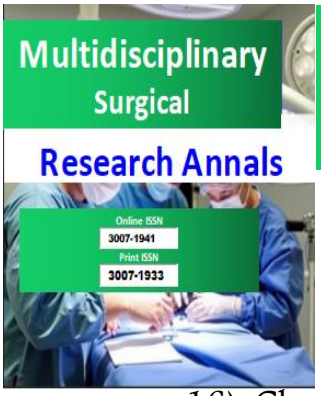

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