Sudan University of Science and Technology

Collage of Graduate Studies

Detection of Hepatitis C Virus Antibodies among Sudanese Barbers at Omdurman City

الكشف عن الاجسام المضادة لالتهاب الكبد الوبائي (ج) لدى الحلاقين السودانيين بمدينة أمدرمان

A dissertation Submitted in Partial Fulfillment of the Requirements for

M.Sc. Degree in Medical Laboratory Science (Medical Microbiology).

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الآية

قَالَ تَعَالَىٰ:

﴿ يَرْفَعِ ٱللَّهُ ٱلَّذِينَ ءَامَنُواْ مِنكُمْ وَٱلَّذِينَ أُوتُواْ ٱلْعِلْمَ دَرَجَٰتٍۚ وَٱللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ ﴾

صدق الله العظيم

سورة المجادلة الاية (١١)

Dedication

To the soul of my mother

To my lovely father who is my all life

To my husband

To my sister's

To my Aunts & Uncles

To my friends

Acknowledgments'

First and foremost, I must acknowledge our limitless thanks to ALLAH, I would like to sincerely thank my supervisor prof. Yousif Fadlalla Hamed Elnil for his guidance and support throughout our my time in this research. My sincere thanks extended also to the teaching staff of the department of Microbiology and Faculty of Medical Laboratory Science.

Abstract

Hepatitis C virus has some common epidemiological characteristics, and infects millions of people throughout the world. During haircut, shave, or pedicure, barbers may accidentally expose to their clients' blood, transmit their own infection to them, or transmit the infection from one client to another. This study aimed to detect the antibody of *hepatitis C* among Sudanese hair dressers population. This was a cross sectional study conducted during the period from January to November 2022 on 91 Sudanese hairdressers. Blood specimen was collected from 91 hairdressers with age ranging 20-55 years. Personal and clinical data were collected by questionnaire after verbal consent. All specimens were tested for the presence of HCV IgM antibodies using ELSIA kit. The result of the study showed that HCV IgM antibodies were detected in 4 (4.3%) of the total specimens examined and most of them had negative for infection (95.7%). Most of the studied hairdresser had primary level of education followed secondary level and graduated level, most of them had information about HCV virus. Regarding source of information about HCV virus, internet demonstrated the main source of information, followed by, friends and then doctors. The hairdressers had good practice in their shops. The finding of this study indicates low frequency of HCV among barbers in Sudan.

المستخلص

التهاب الكبد الوبائي (ج) له بعض الخصائص الوبائية الشائعة أصابت الملايين من الناس في جميع أنحاء العالم. أثناء القص أو الحلاقة أو العناية بالأقدام ، قد يقوم الحلاقون بالتعرض لدم زبائنهم عن طريق الخطأ ، أو نقل العدوى إليهم ، أو نقل العدوى من عميل إلى آخر ، وتهدف هذه الدراسة إلى الكشف عن الأجسام المضادة التهاب الكبد الوبائي C بين مصففي الشعر السوداني. تم إجراء هذه الدراسة المقطعية العرضية خلال الفترة من ابريل٢٠٢٢ إلى اغسطس ٢٠٢٢ على٩١ مصفف شعر سوداني ، تم جمع عينة دم من ٩١ مصفف شعر تتراوح أعمارهم بين ٢٠-٥٥ سنة. كانت البيانات الشخصية والسريرية تم جمعها عن طريق استبيان بعد الموافقة اللفظية ، تم اختبار جميع العينات لوجود الأجسام المضادة لـ HCV IgM باستخدام اختبار مجموعة ELSIA. أظهرت نتيجة الدراسة الحالية أن الأجسام المضادة لـ HCV IgM قد تم اكتشافها في٤,٣٪ من العينة الكلية التي تم فحصها وأن معظمها لم يكن مصابًا بالعدوى٩٥,٧. معظم مصففي الشعر الذين شملهم الاستطلاع حصلوا على مستوى تعليمي ابتدائي ٤٠,٠% يتبع المرحلة الثانوية ٣٥,٠% والمستوى الجامعي ٢٥,٠% ، وكان لدى معظمهم معلومات حول فيروس التهاب الكبد الوبائي ، وفيما يتعلق بمصدر المعلومات حول فيروس التهاب الكبد الوبائي ، كان الإنترنت المصدر الرئيسي للمعلومات ، يليه الأصدقاء ثم الطبيب. كان لمصفف الشعر ممارسة جيدة في متجره. تشير نتائج هذه الدراسة إلى انخفاض معدل الإصابة بفيروس التهاب الكبد C بين مصففي الشعر ٤,٣%.

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List of Abbreviation

ALT	Alanine aminotransferase
ELISA	Enzyme Linked ImmunoSorbent Assay
HBsAg	hepatitis B antigen
HCV	hepatitis C virus
HIV	Human Immuno deficiency Virus
HVR1	hyper variable region 1
PCR	Polymerase Chain Reaction
RNA	Ribonucleic Acid
SPSS	Statistical Package for Social Science
WHO	World Health Organization

Chapter I

Introduction

Chapter I

1. Introduction

1.1 Background

Hepatitis C is an infectious disease caused by the hepatitis C virus (HCV) that primarily affects the liver; it is a type of viral hepatitis. During the initial infection people often have mild or no symptoms. Occasionally a fever, dark urine, abdominal pain, and yellow tinged skin occurs. The virus persists in the liver in about 75% to 85% of those initially infected. Chronic infection typically has no symptoms. It often leads to liver disease and occasionally cirrhosis. In some cases, those with cirrhosis will develop serious complications such as liver failure, liver cancer, or dilated blood vessels in the esophagus and stomach. HCV is spread primarily by blood-to-blood contact associated with injection drug use, poorly sterilized medical equipment, needle stick injuries in healthcare, and transfusions. Using blood screening, the risk from a transfusion is less than one per two million. It may also be spread from an infected mother to her baby during birth. It is not spread by superficial contact. It is one of five known hepatitis viruses: A, B, C, D, and E (Ryan KJ, Ray CG, 2004).

Currently, hepatitis C is the major cause of post-transfusion hepatitis. HCV is a main reason for hepatitis in intravenous drug users (IV). Moreover, the virus is responsible for at least 50% of the cases of community acquired sporadic hepatitis, and in many cases the route of virus transmission is unknown (Chakravarti *et al*; 2005). Thus, patients with acute hepatitis or HIV infection may not be aware of the infection, and cause transmission of the infection to others. However the prevalence of HBsAg positive and anti-HCV are similar to general population, (Amodio *et al*; 2010) these infections are transmitted through body fluids such as saliva, urine, sweat, semen, and vaginal secretions, as well as blood and blood products (Koziel and Siddi; 2005). It appears that poor occupational factors in barbers' salons bring about health problems of the hairdressers (Mandiracioglu *et al*; 2009).

Beauty salons and barbershops are considered permanent public spaces for youths (at least once a month), and in the space, the young generation exchange information, and

communicate with their peers outside the educational environment (schools and universities). Therefore, the knowledge and awareness of barbers and hairdressers toward topics related to AIDS, and hepatitis B and C are of great importance. It highlights the need to improve specific health messages in media campaigns carried out to general population, diffusing more appropriate educational materials for salons and organizing obligatory refresher courses for the hairdressing sector (Amodio *et al*; 2010).

1.2 Rationale

Blood-borne viruses such as Hepatitis B, *hepatitis* C, have infected millions of people worldwide. During haircut or shaving, barbers may accidentally expose to their clients' blood, transmit their own infection to them, or transmit the infection from one client to another. So the knowledge of barbers toward topics related to AIDS, hepatitis B, and C are of great importance (Behrooz and Kiana; 2012)

To determine the situation in the Sudan since many studies have be conducted about the virus.

1.3 Objectives

1.3.1 General objective

To detect the antibodies of hepatitis C among Sudanese hair dressers population in Omdurman City.

1.3.2 Specific objective

1. To detect the percentage of Hepatitis C infection on blood from barbers.
2. To find the relations between Hepatitis hepatitis C infection and age group, education and knowledge.
3. To compare between Practices of hair dressers in their shops and hepatitis C infection.

Chapter II

Literature Review

Chapter II

2. Literature Review

2.1 Definition of Hepatitis C virus

Hepatitis C is a viral infection that causes liver inflammation and damage. Inflammation is swelling that occurs when tissues of the body become injured or infected. Inflammation can damage organs. Viruses can invade normal cells in the body. Many viruses cause infections that can be spread from person to person. The hepatitis C virus spreads through contact with an infected person's blood. Hepatitis C can cause an acute or chronic infection (Kabiri *et al*; 2014).

2.1.1 Geographical distribution of *Hepatitis C* virus

Globally, an estimated 71 million people are living with HCV infection (chronically infected), and approximately 400,000 were estimated to have died from HCV-related liver disease in 2013. Although the quality of epidemiologic data and prevalence estimates very widely across countries and within regions, the most recent global estimates indicate that the viremic prevalence of HCV infection (prevalence of HCV RNA) is <1.0% in most developed countries, including the United States. The prevalence is considerably higher in some countries in Eastern Europe (3.3% in Russia, 2.2% in Latvia) and certain countries in Africa (6.3% in Egypt, 7.0% in Gabon), the Middle East (3.0% in Syria), the South Caucasus and Central Asia (4.2% in Georgia, 4.3% in Uzbekistan) and southern and eastern Asia (3.8% in Pakistan, 6.4% in Mongolia, 2.1% in Taiwan) (Smith *et al*; 2014).

2.1.2 Epidemiology in Sudan

Hepatitis C virus (HCV) is a major cause of end stage liver disease in many parts of the world. One hundred and seventy million people are estimated to be infected worldwide. Studies on the epidemiology of HCV have suggested that the Nile delta region of Egypt has one of the highest prevalence rates of HCV infection in the world with seroprevalence rates approaching 20% in villagers over the age of 30 years. This was largely attributed to infection with schistosomiasis and to mass treatment with parenteral anti shistosomal therapy. The few studies on HCV infection in Sudan

demonstrated a low seroprevalence ranging from 2.2% in the Gezira State, an area endemic with schistosomiasis to 4.8% in patients with schistosomal periportal fibroses. Genotype 4 was the commonest isolated genotype. No association was found between HCV infection and schistosomiasis or with parenteral anti schistosomal therapy. Similar HCV seroprevalence was noted in other African countries such Ethiopia (2%), Central African Republic (5%), and Libya (7.9%). Genotype 4 was also the commonest genotype isolated in Cameron, Nigeria, Egypt and the Central African Republic (Hatim Mudawi; 2008).

2.1.3 Mode of Transmission

HCV is transmitted primarily through blood to blood contact, predominantly through the following modes of infection:

Injecting drug use: The highest risk is related to reuse of needle/syringes, with associated blood contamination, but sharing of other contaminated injecting equipment (swabs, filters, water, spoons, and tourniquets) can lead to transmission (Terrault ; 2002).

. Receipt of donated blood, blood products, and organs: Donor screening was introduced in early 1990 in Australia, with current nucleic acid testing virtually eliminating risk of transmission through blood products in Australia. Blood transfusion may still represent a risk for HCV transmission in countries with limited resources(Terrault ; 2002).

Iatrogenic exposure in health care settings: HCV transmission has occurred in a small number of cases in Australia through blood exposures to health care workers and patients, generally as a result of inadequate infection control practice. Such exposures are likely to occur more frequently in resource limited countries, particularly those with high HCV prevalence (Terrault ; 2002).

Other procedures involving skin penetration: Tattooing and body piercing may be associated with a small number of cases in Australia, particularly in circumstances where there is poor infection control. Other routes of exposure are also associated with HCV transmission: Perinatal exposure: The risk of HCV transmission from a mother who has chronic HCV infection to a newborn or infant is from 4 to 7%, with a four to five-fold higher risk if HIV infection is also present in the mother (Roberts

and Yung; 2002). Sexual exposure: HCV transmission is more common in people with HIV infection, particularly in men who have sex with men (MSM) (Van de Laar *et al*; 2009). People with HIV who are heterosexual partners of those with HCV are also more likely to acquire HCV (Terrault; 2002). Transmission to people without HIV through heterosexual unprotected sex has been reported but the risk is extremely low, even in the context of long-term regular partnerships. Other potential sources of HCV exposure, including sharing of household equipment (razors, toothbrushes) with potential exposure to blood are considered to be extremely uncommon modes of HCV transmission (Roberts and Yeung; 2002).

2.1.4 Structure of Hepatitis C virus

The hepatitis C virus belongs to the genus Hepacivirus, a member of the family Flaviviridae. Before 2011, it was considered to be the only member of this genus. However a member of this genus has been discovered in dogs: canine Hepacivirus. There is also at least one virus in this genus that infects horses. Several additional viruses in the genus have been described in bats and rodents. The hepatitis C virus particle consists of a lipid membrane envelope that is 55 to 65 nm in diameter. Two viral envelope glycoprotein's, E1 and E2, are embedded in the lipid envelope. They take part in viral attachment and entry into the cell. Within the envelope is an icosahedra core that is 33 to 40 nm in diameter. Inside the core is the RNA material of the virus.

2.1.4.1 E1 and E2 glycoprotein's

Hepatitis C virus envelope glycoprotein's bind to specific proteins at the surface of hepatocytes to initiate the entry process. This process involves a surprisingly large number of host receptors/co-receptors/factors, and also confers the major determinant of viral tropism. These host receptors/co-receptors/factors have been well summarized by recent reviews. Of them, scavenger receptor BI (SR-BI), cluster of differentiation 81 (CD81), and two tight junction proteins claudin-1 (CLDN1) and occludin1 (OCLN) play the most critical role in HCV entry, and thus are regarded as the real viral receptors/co-receptors. (Yimin Tong *et al*; 2018).

A recent single viral particle imaging analysis on the polarized cell culture revealed a sequential engagement of these receptors/co-receptors during HCV entry which involves the translocation of HCV from the initial contact site on the basolateral membrane to the tight junction. E2 is the major HCV envelope protein that directly interacts with the receptors/coreceptors. The physical interactions between E2 and CD81, SR-BI have been biochemically demonstrated, sometime even in the absence of E. It is long believed that the role of E1 in this process is mainly to assist E2 by maintaining a functional E2 conformation required for the receptor binding. Indeed, it was showed that the E1E2 complex can interact with CLDN1 whereas E2 alone cannot. Consistently, two independent studies showed that mutations in E1 can shift the usage of HCV entry factor from CLDN1 to CLDN6, highlighting the importance of E1 in interaction with CLDN1 during HCV entry process. Furthermore, a critical cross talk between E1 and E2 was identified to modulate E1E2 binding to HCV entry receptors SR-BI and CD81. Interestingly, recent studies suggested that the role of E1 in virus attachment and binding appears more than just assisting E2. A study showed that E1, but not E2, binds ApoE and Apo B, the apolipoproteins that are decorated on HCV virions and are crucial for HCV entry through low-density lipoprotein receptor. However, this observation was contradicted by a later study showing that E2 instead of E1 interacts with ApoE. Another study showed that E1 directly binds CD36 to facilitate HCV attachment (Yimin Tong *et al*; 2018)

2.1.5 Pathogenicity of Hepatitis C

HCV infection is of rising public health concern due to substantial effect on morbidity and mortality, it is aleading cause of cirrhosis, hepatocellular carcinoma (HCC), liver transplantation and liver related death (Getie, *et al*; 2021)

HCV is a non-cytopathic virus that enters the liver cell and undergoes replication simultaneously causing cell necrosis by several mechanisms including immune-mediated cytolysis in addition to various other phenomena such as hepatic steatosis, oxidative stress and insulin resistance. The proteins/peptides encoded by different sub-genomic regions of the HCV genome and their quasi species influence the above mechanism, and thus, have a significant role in HCV pathogenesis and disease causation (Mohammad Irshad *et al*; 2013)

2.1.6 Clinical presentation and outcome

The majority of people with newly acquired HCV infection are asymptomatic or mildly symptomatic (lethargy, abdominal discomfort). From 15 to 45% of people undergo spontaneous viral clearance (generally within 6 to 12 months of infection) as defined by loss of detectable HCV RNA in the absence of treatment (Jauncey *et al*; 2004). Only a minority of cases will have an acute HCV illness with jaundice and elevated alanine aminotransferase (ALT) (Busch and Shafer; 2005). Fulminant acute hepatitis C is rare. Approximately55 to 85% of those with acute infection will develop chronic HCV infection with persistent viraemia and HCV-related liver disease (Blackard *et al*; 2008). Liver disease progression, through stages of inflammation, fibrosis (mild, moderate, severe) and cirrhosis, occurs in a proportion of those with chronic infection but is not inevitable and is generally slow with a highly variable course. An estimated one third of those who become chronically infected will develop liver cirrhosis or hepatocellular carcinoma in the long term (Seeff; 2002). Factors that have been associated in observational studies with higher rates of disease progression include older age at infection, heavy alcohol intake, regular marijuana smoking, HIV or chronic HBV co-infection, obesity and diabetes. Among people with HCV-related cirrhosis, the risk of hepatocellular carcinoma is 2-3% per annum with a similar risk of progression to liver failure. In addition to liver disease, HCV has been associated with several extra-hepatic manifestations or syndromes, including autoimmune disorders, mild cognitive impairment and chronic fatigue (Seeff ; 2002).

2.1.7 Diagnosis of hepatitis C

2.1.7.1 Laboratory testing

Detection of antibodies to HCV polypeptides by anti-HCV-ELISA (90%95% sensitive) or direct detection of HCV RNA (Gold standard) (Chen and Kasturi, 2010).

Quantitative real-time PCR is essential for monitoring patients on antiviral therapy. Nucleic acid hybridization is used to determine genotypes of HCV isolates as well as for the detection of viral RNA in liver biopsy specimens (Generalov, 2016).

Diagnosis of Hepatitis C involves confirmation of the diagnosis of HCV infection and assessment of the severity of the liver disease. In addition, the evaluation of patients

with Hepatitis C should include the determination of the patient's suitability for treatment. Diagnostic tests for hepatitis C can be divided into the following two general categories: Serological assays that detect antibodies to hepatitis C virus (anti-HCV). And Molecular assays that detect, quantify, and/or characterize HCV RNA genomes within an infected patient. Serological assays have been subdivided into screening tests for anti-HCV, such as the enzyme immunoassay (EIA), and supplemental tests such as the recombinant Immunoblot assay (RIBA). Three generations of anti-HCV tests have been developed, and each generation has resulted in an improvement in the sensitivity of detecting anti-HCV Third-generation anti-HCV tests (EIA-3 and RIBA-3, respectively) contain antigens from the HCV core, non- structural 3, nonstructural, 4 and nonstructural 5 genes (Daw, 2014).

2.1.7.1.1 Serology

Current tests are both sensitive and specific (the specificity of current immunoassays for anti-HCV is greater than 99%). However, false positive results may occur. A positive result is more likely to be a false positive when testing is performed among populations where the prevalence of HCV is low and/or where the reactivity of the assay is low. Therefore a second immunoassay using an assay with a different antigen source or an immuno blot is routinely performed to confirm new positives. False negative results may occur with severe immunosuppression such as infection with HIV, solid organ transplant recipients, hypo- or aggammaglobulinaemia or in patients on haemodialysis. Anti-HCV IgG can be detected in the serum or plasma using a number of immunoassays. However, detection of specific antibody does not differentiate between acute and chronic infection, previous exposure, or passive antibody transfer. IgM tests, which usually indicate acute infection. IgG are not clinically useful for HCV. Cases with spontaneous viral clearance will usually remain HCV antibody positive for life (Ghany *et al*; 2011).

2.1.7.1.2 Nucleic acid testing

A nucleic acid test (e.g. PCR test) detects HCV RNA and is therefore a marker of viraemia and current infectivity. A single negative PCR does not rule out infection, as viraemia may be intermittent, particularly during acute infection. Currently available assays have excellent specificity (from 98 to 99%013). Both qualitative and

quantitative HCV PCR tests are available but only the former are registered as diagnostic tests. Quantitative HCV PCR tests are only registered for patient management (Ghany *et al*; 2011).

2.1.7.1.3 Genotyping Assays

Determining the specific HCV genotype can be useful in epidemiological studies and in clinical management because it is associated with treatment outcome (Doyle *et al*; 2013).

2.1.7.1.4 Test interpretation

The diagnosis of acute, chronic or cleared HCV infection requires testing of serum for both antibody to HCV (anti-HCV) and for HCV RNA. The differentiation of acute from chronic HCV infection may be difficult or impossible in the short-term, and require individual assessment of clinical information including history of symptoms and risk factors and previous test results including any previous liver function tests. After exposure, HCV RNA is usually detectable in serum before antibody; HCV RNA can be identified within two weeks following exposure (Blackard *et al*; 2008) whereas anti-HCV is detectable between 20 to 150 days following exposure(Busch and Shafer; 2005).

2.1.8 Treatment of Hepatitis C

Even before HCV was identified as the chief etiologic agent in non-A, non-B hepatitis, interferon Alfa therapy was associated with normalization of alanine aminotransferase levels in some persons who were given this diagnosis. In 1989, the first cases of successful treatment of documented HCV infection with interferon Alfa were reported (Georg, *et al*., 2001).

Ribavirin and pegylated α-interferon. The response is best in patients with genotypes 1 and 2 and those with low initial viral load, but up to 80% will clear the virus. Liver fibrosis or necrotic inflamation from HCV infection is an indication of liver transplantation (Gillespie and Bamford, 2012).

2.2 Previous study

In our study, 240 hairdressers participated. There was a statistically significant relationship between the education level and knowledge score of the hairdressers (P = 0.048). We found a statistically significant relationship between the knowledge level and the working history of hairdressers according to the Pearson's correlation coefficient (P = 0.02). The results show significant relationship between the education level and the practice scores (P = 0.005). Also the working history of hairdressers and their practice score had a significant relationship (P = 0.005). The results did not show significant relationship between the age of the hairdressers and the practice scores (P = 0.12) (Behrooz and Kiana; 2012).

Hassan *et al;* 2020 in port said city,78 % of the study group had poor total level of knowledge, 97.3% had unsatisfactory total practice as well as 95.2% had total negative attitude before conducting the educational guidelines. A highly statistically significant improvement was detected after implementation of the guidelines in their total level of good knowledge (80.7%), satisfactory practice (94.6%) and positive attitude (97.8%). There was a statistically significant positive correlation between the study group's total knowledge score and total practice score (Hassan *et al*; 2020).

Shalaby *et al* in 2010 Anti-HC antibodies were detected in 12.3%.
Knowledge was high among the majority of participants (Shalaby, S *et al*; 2010)

In study done in Pakistan by Jokhio, the Observations showed that 96.2% washed razors with antiseptic after each client and also Bhatti showed knowledge about the diseases and modes of transmission were poor and only 36.6% knew that hepatitis can be transmitted via shaving instruments (Jokhio *et al*; 2010)

Hassan Bin Usman Shah *et al* that Knowledge about hepatitis C was good in urban areas (92%)and this was agree with current study also show Television and internet in the urban areas 51% were the most effective mode of knowledge/awareness about Hepatitis C and this was similar to current study (Hassan Usman *et al*; 2015).

Study done in Khartoum state in 2008 involved 194 barbers prevalence of HCV ranges between 2-2.2, study show public media were most effective mode of knowledge and show that only 45.8% of barbers washed their hands between customers. (Nagla and Hatim, 2008).

Chapter III

Materials and Methods

3. Materials and Methods

3.1 Study design

This was descriptive cross sectional study.

3.2 Study area and duration

This study was conducted in Omdurman barbers shops in Khartoum State, during the period from January to November 2022.

3.3 Study population

The study was carried on Sudanese hairs dresser in Khartoum State.

3.4 Selection criteria

3.4.1 Inclusion criteria:

All cases were: adult, Sudanese hairs dressers

3.4.2 Exclusion criteria

Sudanese people Other than hair dresser

3.5 Sample size

Ninety one blood sample collected from male hair dressers.

3.6 Ethical Considerations

Permission to carry out the study was obtained from collage of medical laboratory science, permission of laboratory manger was taken before beginning. Every sample was collected after verbal approval by volunteer Data and records were kept at complete confidently and privacy.

3.7 Laboratory investigation

3.7.1 Sampling Technique

Simple Random sample

3.7.2 Sample collection and preservation

70% ethanol was used to clean the skin. Three ml of venous blood was collect from hair dresser in plane container and left to clot. Then the samples were centrifuged and the serum was separated in sterile container and stored at – 20 Cº until analysis.

3.8 Sample analysis

The sample was analyzed for the presence of *Hepatitis C* antibody by commercially available enzyme linked immunosorbent assay ELIZA (USA company)

3.8.1 Test procedure

The specimens were added according to the ELISA working sheet, the blank well was left clean, then 100µl was added in control well from positive and negative control in to the designed control wells respectively. Then 100µl of sample diluents was added to all test well then 10 µl of test adjustment was transfer to each test well respectively, Gently the plate was shacked for 20 second then cover the plate with sealer and microwell was incubated at 37 Cº for 30 minutes. Automatic plate washer calibrated to ensure efficient washing, each well was filled with 350 µl diluents wash buffer and soak for 20-30s and aspirate all well completely and repeated four time. 100µl HRP-protein A was added except the blank well, the plate was covered with sealer and incubated at 37 Cº for 20 minutes, the plate was washed 5 times. 50 µl TMB substrate A and 50 µl TMB substrate B were added in each well included the blank well and incubated at 37 Cº for 10 minutes. The reaction was stopped by adding 50 µl stop solution in to each well , gently mixed for 30 seconds, The micro plate wavelength was set at 450nm, the absorbance (OD) of each well measured against the blank well within 15 minutes after adding stop solution, filter of 620-690nm was used as reference wavelength to optimize assay result.

Calculation of result

Set up the cut off value : the cut of value = o.15 + N ; N= mean OD of negative control .using 0.05 for calculation of the cut off value if less than 0.05

Calculation of specimen OD ratio: calculated by dividing its OD value by cut off value .

Interpretation of the result : specimen with OD ratio ≥ 1.00 considered HCV antibody positive while specimen with OD ≤ 1.00 was considered HCV antibody negative .

Positive result ≥ 0.2

Negative result ≤ 0.2

3.9 Data analysis

Data was analyzed by statistical package for social science (SPSS), version 21. Quantitative date was represented as frequency and percentage. Qualitative date was presented as mean ± SD. Association between qualitative variable was tested using persons chi square (X2) and Fisher's exact tests. Multi logistic regression analysis was used to investigate the interaction between qualitative risk factors.

Chapter four

Results

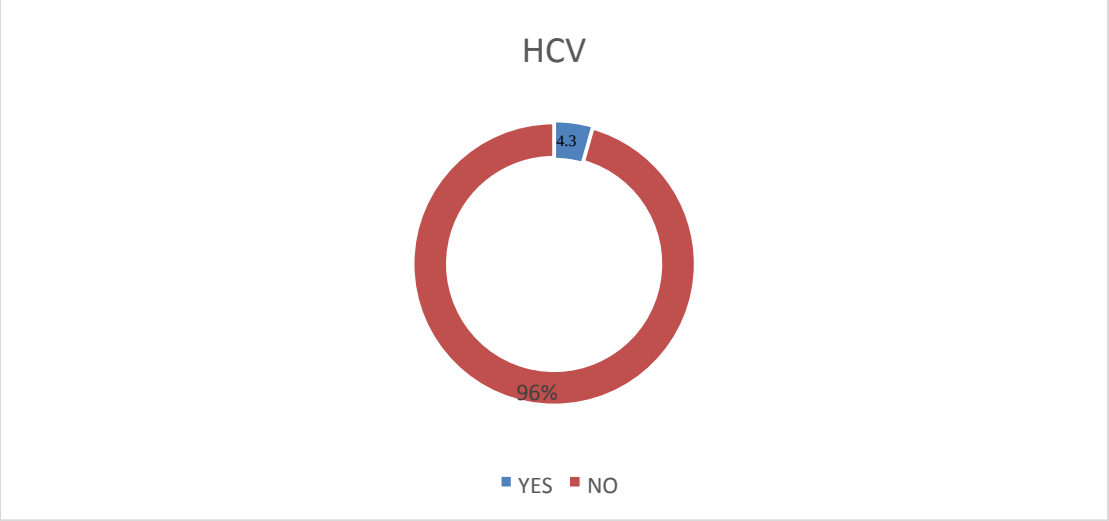
4. Results

4.1The demographic data

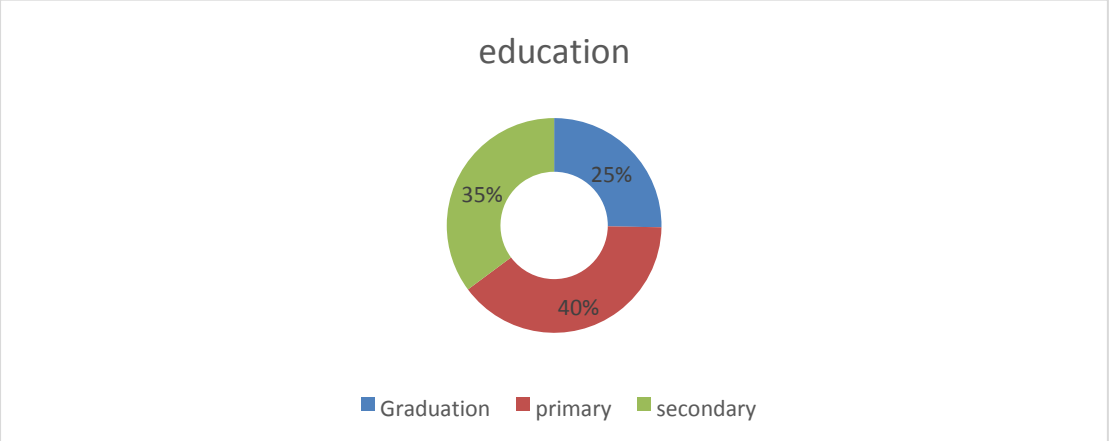
A total of 91 Sudanese hairdresser subjects were enrolled in this study, study was sub divided in to four groups according to age 29 (20-30) 29 (31-40) 27 (41-50) and 6 (above 50) as shown in (Table1). Tthe frequency of studied population were affect with HCV virus were (4.3%) and most of them had no infection (95.7%) as shown in (Figure 1). Most of the surveyed hairdresser had primary level of education (40%) followed secondary level (35%) and graduated level (25%) as shown in (Figure 2), most of them had information about HCV virus (73%) as shown in (Figure 3)

Table 1: The distribution of samples according to age group

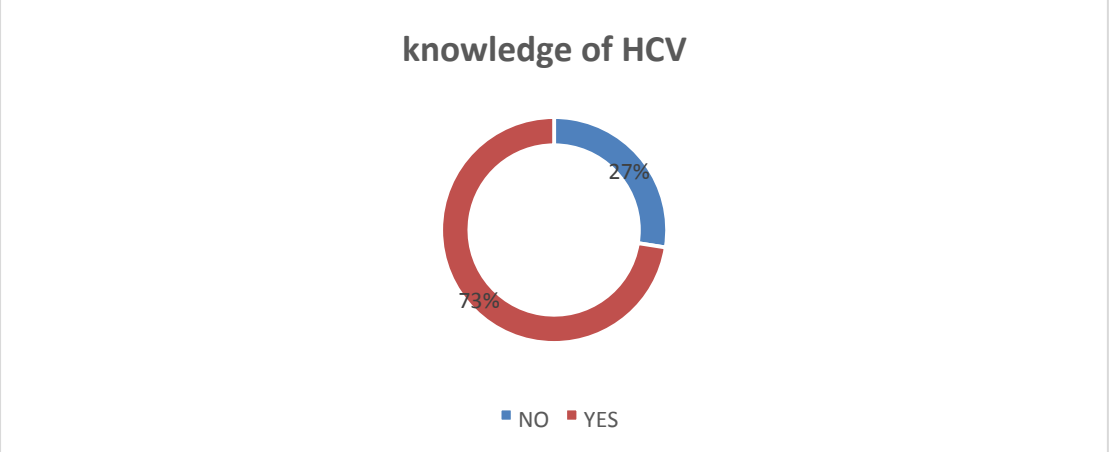
Age	Number of samples	Percent
20-30	29	32%
31-40	29	32%
41-50	27	30%
> 50	6	7%
Total	91	100%



(Figure 1) The Frequency of HCV infection

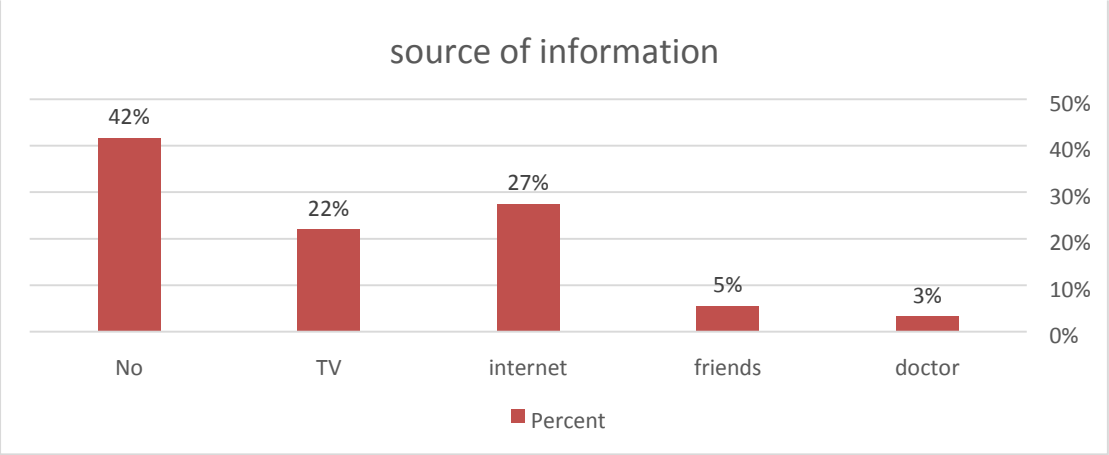


(Figure 2) The Frequency of HCV infection according to Educational level of hairdresser



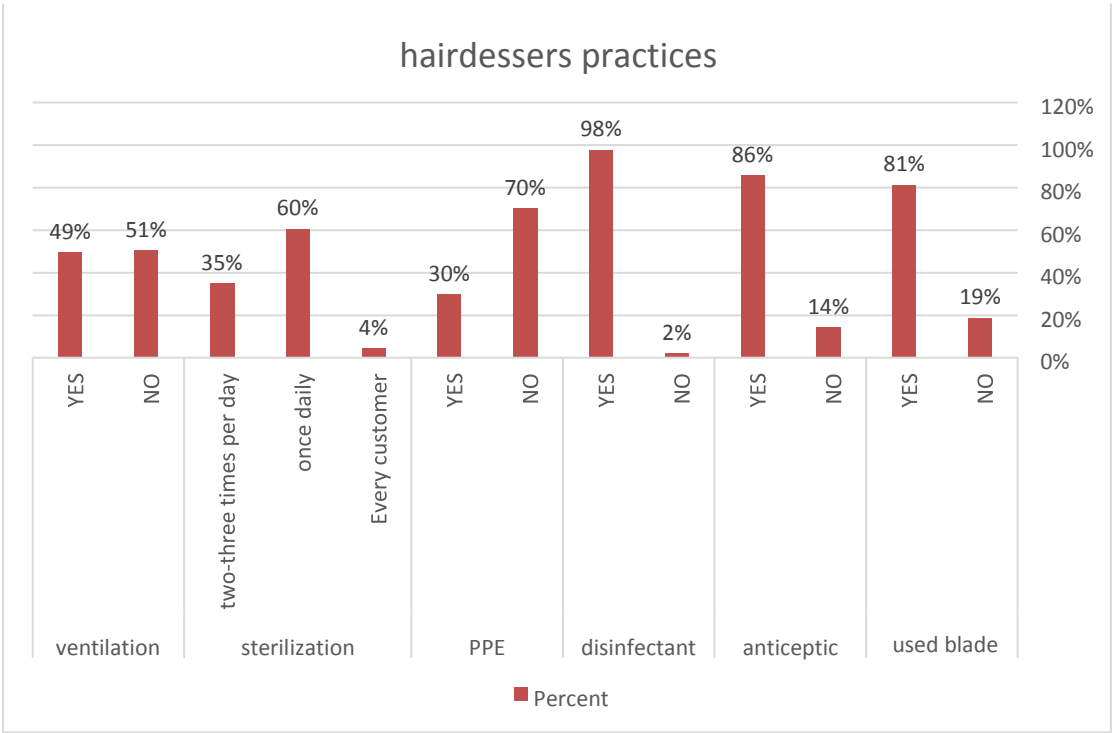
(Figure 3)The Frequency according to knowledge of HCV

Regarding source of information about HCV virus, internet demonstrated the main source of information in 27%, followed by T.V (22%), friends (5%) and then doctor (Figure 4). Interestedly, this study has been source of information to (42%)



(Figure 4)The Frequency according to source of knowledge of HCV

The present study was illustrated that 51% of shop of hairdress had no ventilation, the other part 49% had good ventilation, the hair dresser practices during hair cut, most of them 66% was sterilized his equipment one time per day, 35% two to three per day and 4% every each customer, 89% of hair dresser used disinfectant, the anticeptic was used in most of them (86%) and 14% don't used ,as shown in (Figure 5)



(Figure 5) The Frequency according to practice of HCV

The current study showed that there was no correlation between age and HCV infection (p. value= 0.5) as shown in (Table 2) also there was no statistically significant correlation between educational level and knowledge of HCV (p. value= 0.8) as shown (Table 3) in addition there was no clinically association between sterilization, disinfectant, antiseptic, ventilation and infection with HCV as shown in (Table 4)

Table 2: Correlation between HCV and age

Age		HCV		Total	p.value
		YES	NO		
20-30	Count	0	29	29	0.05
	%	0.0%	33.3%	31.9%	
31-40	Count	0	29	29	
	%	0.0%	33.3%	31.9%	
41-50	Count	3	24	27	
	%	75.0%	27.6%	29.7%	
> 50	Count	1	5	6	
	%	25.0%	5.7%	6.6%	
Total	Count	4	87	91	
	%	100.0%	100.0%	100.0%	

(Table 3) Correlation between education and knowledge about HCV

Education		knowledge about HCV		Total	p.value
		NO	YES		
Graduation	Count	6	17	23	0.8
	%	24.0%	25.8%	25.3%	
primary	Count	9	27	36	
	%	36.0%	40.9%	39.6%	
secondary	Count	10	22	32	
	%	40.0%	33.3%	35.2%	
Total	Count	25	66	91	
	%	100.0%	100.0%	100.0%	

(Table 4) Correlation between practices of hair dressers and HCV

practical of hair dressers			HCV		Total	p.value
			YES	NO		
used blade	NO	Count	0	17	17	0.4
		%	0.0%	19.5 %	18.7 %	
	YES	Count	4	70	74	
		%	100.0%	80.5 %	81.3 %	
Antiseptic	NO	Count	0	13	13	0.5
		%	0.0%	14.9 %	14.3 %	
	YES	Count	4	74	78	
		%	100.0%	85.1 %	85.7 %	
Disinfectant	NO	Count	0	2	2	0.9
		%	0.0%	2.2%	2.2%	
	YES	Count	4	85	89	
		%	100.0%	97.7 %	97.8 %	
PPE	NO	Count	2	62	64	0.3
		%	50.0%	71.3 %	70.3 %	
	YES	Count	2	25	27	
		%	50.0%	28.7 %	29.7 %	

Sterilization	Every customer	Count	0	4	4	0.2
		%	0.0%	4.6%	4.4%	
	once daily	Count	4	51	55	
		%	100.0%	58.6 %	60.4 %	
	two- three times per day	Count	0	32	32	
		%	0.0%	36.8 %	35.2 %	
Ventilation	NO	Count	1	45	46	0.3
		%	25.0%	51.7 %	50.5 %	
	YES	Count	3	42	45	
		%	75.0%	48.3 %	49.5 %	

Chapter V

Discussion, Conclusion and Recommendations

Chapter V

Discussion, Conclusion and Recommendations

5.1 Discussion

Hepatitis C have some common epidemiological characteristics, and have infected millions of people throughout the world. During haircut, shave, or pedicure, barbers may accidentally expose to their clients' blood, transmit their own infection to them, or transmit the infection from one client to another. The present aimed to evaluate the hepatitis C among barbers at Omdurman city.

The present study showed that 73% of hair dressers had knowledge about HCV, this was slightly less than et al with Hassan in 2019 which was reported that 78 % of the study group had poor total level of knowledge (Hassan *et al*; 2019).

In study performed in 2010 Anti-HC antibodies were detected in 12.3%. Knowledge was high among the majority of participants and this was agree with present study which showed that most of the barbers had information about HCV virus (73%) and good practices during shaving and hair-cutting were observed for the majority of barbers (Shalaby, *et al*; 2010) and this was similar with current study which showed that most of barber had good practices.

In study carried out in Pakistan by Bhatti, the Observations showed that 96.2% washed razors with antiseptic after each client and this was agree with present study also Bhatti showed knowledge about the diseases and modes of transmission were poor and only 36.6% knew that hepatitis can be transmitted via shaving instruments (A H Jokhio , T A Bhatti, S
Memon ;2010) and this was dis agreed with present study whitch showed that the knowledge of the barber had information about HCV virus (73%) in addition Hassan Bin Usman Shah et al that Knowledge about hepatitis C was good in urban areas (92%)and this was agree with current study also show Television and internet in the urban areas 51% were the most effective mode of knowledge/awareness about Hepatitis C and this was similar to current study (Usman Shah et al; 2015).

In study worked at Isfahan by Behrooz Ataei the result reported that there was a statistically significant relationship between education level and knowledge score of hairdressers ($P < 0.001$) and this was disagreed with the present study which showed that there was no statistically significant correlation between educational level and knowledge of HCV (p. value=

0.8) the conflict may due to gender variation.

In study worked by Palermo the result reveled that (55.2%) hairdressers received information on occupational biological risks by watching television or reading newspapers and this was disagree with present study which reported that internet demonstrated the main source of information (Amodio *et al*;2010).

5.2 Conclusion

The finding out of this study indicates low prevalence of HCV, seropositive IgM among hair dressers (4.3%).Furthermore, the results showed that the hairdresser had good practice and attitude in their shop, also there was no statistically significant correlation between educational level and knowledge.

5.3Recommendation

1. Further study will large sample size .
2. More educational programs for improving knowledge, practices and healthy attitude of barbers should be integrated into their training programs.
3. Evaluation of the long-term effects of such education programs are also recommended.
4. Replication of similar specific studies using large probability samples at different settings is highly recommended .
5. Reguar testing and screening of barbers to detect the infected one.
6. Vaccination.

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Appendix

Questioners

1-Age ____ Years

2-Educational level: primary ____ Secondary ____ Graduate

3-Social status: Single ____ Married ____ divorced

4-Working duration: Less than 5 years ____ 5_10 ____ More than 10 years

Knowledge of hair dressers and clients about HCV infection:

5-Do you know about HCV diaease? Yes ____ No

6- Do you know about the mood of transmission:

Blood transfusion ____ reusing needles ____ Scissors ____ hair dressers instrument

Sexual contact ____ tattooing ____ Sharing utensils ____ food ____ water ____

others _____

6-Source of information:

Friends and realvtives ____ TV ____ Doctors ____Internet ____ Co works ____ Others _____

Attitude of hair dressers and clients towards risk factors for HCV:

7-Concerning about status of used blades? Yes ____No

8-Concerning about using antiseptics? Yes ____ No

Practices of hair dressers in thire shops:

9-Changes the blade for each client? Yes ___ No

10-disinfects the instrument? Yes ____ No

11-Wears protectiveclothes or gloves? Yes ___ No

12-frequently of sterilization: once a day ____ after every customer ____ once weekly

2-3 times per week ____ one on customer needed request

13-Hand washing after each customer? Yes ____ No

Observation items:

Hair dressers shop:

A-has adequate ventilation? Yes ____ No

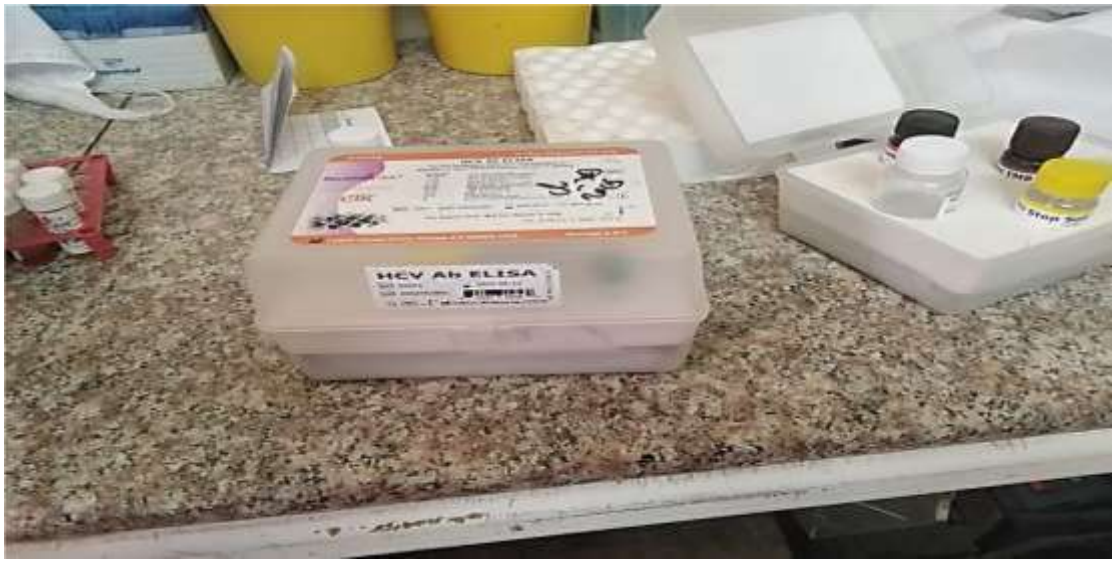
B- has adequate sinks for washing hand and face

Image 1 HCV ELISA kits

Image 2

ELISA Washer (Hydro flex)

Image 3

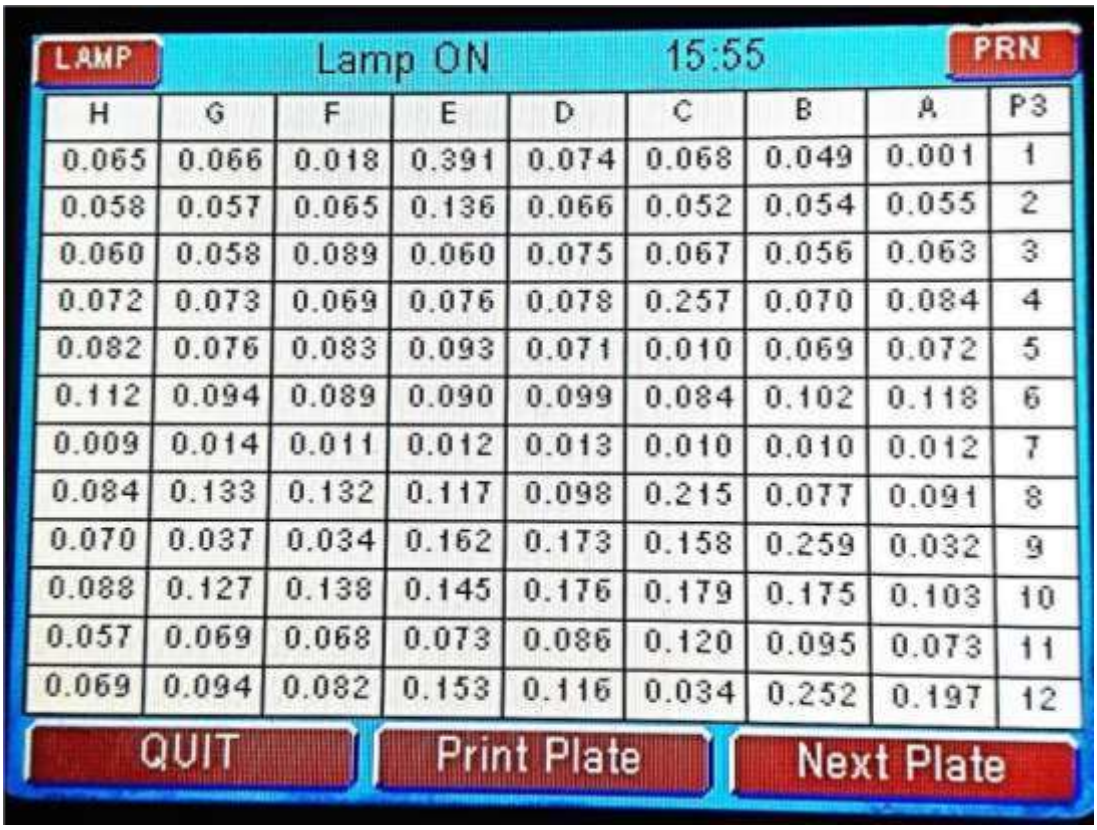


HCV Ab ELISA kit (Recombilisa. USA)

Image 6

ELISA Reader (Star 4200)

Image 7



H	G	F	E	D	C	B	A	P3
0.065	0.066	0.018	0.391	0.074	0.068	0.049	0.001	1
0.058	0.057	0.065	0.136	0.066	0.052	0.054	0.055	2
0.060	0.058	0.089	0.060	0.075	0.067	0.056	0.063	3
0.072	0.073	0.069	0.076	0.078	0.257	0.070	0.084	4
0.082	0.076	0.083	0.093	0.071	0.010	0.069	0.072	5
0.112	0.094	0.089	0.090	0.099	0.084	0.102	0.118	6
0.009	0.014	0.011	0.012	0.013	0.010	0.010	0.012	7
0.084	0.133	0.132	0.117	0.098	0.215	0.077	0.091	8
0.070	0.037	0.034	0.162	0.173	0.158	0.259	0.032	9
0.088	0.127	0.138	0.145	0.176	0.179	0.175	0.103	10
0.057	0.069	0.068	0.073	0.086	0.120	0.095	0.073	11
0.069	0.094	0.082	0.153	0.116	0.034	0.252	0.197	12

RESULTS