Prevalence of

Hepatitis B&C

in Pakistan

Pakistan Medical Research Council

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Contents

Provincial Prevalence

District Prevalence

Prevalence in Children

Foreword

Realizing the importance of hepatitis B and C in the country, Ministry of Health along with Standing Committee on Economic Affairs and Statistics assigned Pakistan Medical Research Council to do the survey for disease and thus assist the Ministry in calculating the disease quantum, identify the most probable route /source of disease transmission so that guidelines could be developed to prevent it.

I congratulate Pakistan Medical Research Council for conducting this first hepatitis B and C survey in the general population of Pakistan. The Statistics Division and Federal Bureau of Statistics assisted in drawing the scientific and representative sample size for the country. About 7000 houses in 350 Primary Sampling Units (PSU) allover Pakistan were surveyed comprising of about 49000 persons. Interviews were conducted and all available/consenting individuals were tested for hepatitis B and C.

The survey was done over almost a year where teams and its monitoring officers traveled the extremes of temperatures and places with restricted movements. The teams worked very hard and with full dedication. The compliance for testing from the population was excellent and no where the teams felt threatened or unwanted. The continuous supervision and regular supplies by the collaborating partners-Citilab was commendable and played a major role in timely completion of task.

The data shows 2.5% prevalence of hepatitis B and 5% of hepatitis C in general population. Within the provinces the hepatitis B was very high in Balochistan (4.3%) while it was 2.5% in Sindh, 2.4% in Punjab and 1.3% in NWFP. For HCV the disease was highest in Punjab (6.7%) followed by Sindh (5.0%), Balochistan (1.5%) and NWFP (1.1 %).

The data shows that for hepatitis B prevention we need to enhance hepatitis B vaccination in the population. For HCV the major source of infection is syringe reuse for therapeutic injections by the health care providers. To prevent syringe re use an easy way is to destroy syringe by cutting it. Moreover over 60% of the injections used by the health care providers are unnecessary. The higher is the injection use in a country the higher would be the blood born diseases. Therefore we also need to reduce our injection rate per person from the present 13 injections to 4-5 injections per person per annum.

Dr Huma Qureshi, Executive Director of PMRC and the PMRC research centres in different provinces were the work force behind all this effort and she has set a good example of coordination and collaboration.

Khushnood Akhtar Lashari
Secretary Health

Acknowledgments

Pakistan Medical Research Council would like to offer special thanks to Mr. Asad Elahi, Secretary Statistics for taking the initiative to invite PMRC to do this survey. The unconditional support of Mr. Khushnood Akhtar Lashari, the Secretary of Health, Ministry of Health in making this otherwise difficult task a walk over for us is greatly acknowledged.

The participation and support of senior staff of Federal Bureau of Statistics in taking out the sample size and timely provision of alternate PSUs in difficult areas of Sindh during floods and in trouble areas of Balochistan and NWFP and the support of their provincial coordinators and assistants in identification of areas and houses in extremely poor law and order situation areas of Balochistan and NWFP is appreciated with gratitude. Without their support this survey was impossible.

The active participation of staff and officers of the PMRC Research Centres in the survey and monitoring shows the will and eagerness of the researchers to undertake national studies with dedication and commitment. Thanks are due to all my team members from within PMRC and outside, whose tireless efforts made this impossible task possible. The tireless efforts of Mr. Mahmood Ahmed in organizing the visits to monitoring sites and bringing FBS teams in close collaboration with PMRC were a major contributor in completing the task. The data analysis was done with full dedication by Syed Ejaz Alam of PMRC, JPMC who has worked day and night on the data and brought out scientific and yet simple data which is easy to understand even by lay public.

Citilab wishes to thank Dr Muhammad Badar-e-Alam who provided insight into technical issues regarding collection, transportation and testing of blood samples. Thanks are also due to Dr Ashar Alamgir, Dr Zeeshan Ahmed and Dr Azfar for overseeing work of the teams and facilitating sample collection and to Dr. Kiran, Dr. Huma and Dr. Rakia in providing support in sample verification, labeling and data entry. Last but not least the efforts of Mr. Ghulam Fareed are appreciated with profound gratitude for providing support to our teams during sample collection by traveling all over the country to ensure right sample collection.

Executive Summary

The first prevalence report on Hepatitis B and C in Pakistan

Meta analyses of over 300 papers published on hepatitis in Pakistan from 1980-2004 were analyzed to get cumulative figures for the disease. Over 95% of these studies were hospital or clinic based, therefore carried a biased figure. These figures were 3-4% for hepatitis B (HBV) and 4-6% for hepatitis C (HCV) making an overall aggregate of 7-10%. Reflecting these figures on 160 million population it was estimated that about 16 million cases are exposed to these 2 viruses. As these were hospital based studies, therefore, there was a strong need to do the actual prevalence study and find out the disease burden.

This is the first survey on the prevalence of hepatitis B and C in Pakistan conducted from July 2007 to May 2008. The survey was done in collaboration with Ministry of Health, Statistics Division, Federal Bureau of Statistics (FBS) and Pakistan Medical Research Council (PMRC).

The contract was outsourced to Citilab, a private laboratory. The formulation of field teams, their training, transport and logistic arrangements in the fields were the responsibility of the contract laboratory. The teams collected baseline household and personal information performed blood tests at the site and gave reports to those who were tested. The extra blood was frozen for further use.

PMRC did the overall monitoring of the project in collaboration with the Executive District Officers (EDO), Nazims or seniors of the community.

A sample size of 7000 houses in 350 primary sampling units (PSUs) all over Pakistan was calculated by FBS. Each PSU had 20 houses; with an average family size of 6.7 persons per house, about 47000 persons were expected to be checked.

Whole blood devices were used and their sensitivity and specificity was checked against ELISA using serial dilutions. Only devices having an over 98% sensitivity and specificity were used.

A total of 47043 persons were screened. Overall prevalence of hepatitis B (HBsAg) was 2.5% and hepatitis C (HCV) was 4.9%. Overall HBeAg positivity was 14.4% with 17% in Balochistan, 15.3% in Sindh, 14.1% in Punjab and 8.4% in NWFP. For HCV the prevalence within provinces showed 5% in Sindh, 6.7% in Punjab, 1.1% in NWFP and 1.5% in Balochistan. For HBV the figures were 2.5% in Sindh, 2.4% in Punjab, 1.3% in NWFP and 4.3% in Balochistan.

The sample size was more targeted towards getting the country and provincial prevalence, therefore although all districts were checked but their figures can not be used as the real prevalence in each district. Prevalence of HCV and HBV in different districts is given below.In Sindh the HBV figures were high in Khairpur (6.3%), Ghotki (5.9%), Larkana (4.3%), Noshero Feroze (4%). For HCV very high figures were seen in Ghotki (12.7%), Sanghar (7.8%), Dadu (7.2%), Hyderabad (5.7%), Thatta (5.4%), Shikarpur and Jacobabad 5.3% each.

In Punjab high figures for HBV were seen in Dera Ghazi Khan (5.7%), Islamabad (5.6%), Rahim Yar Khan (4.7%) and Jhang (4.1%). The figures for HCV were very

high in Vehari (13.1%), Hafizabad (12.9%), Pakpattan, (10.6%) and Bahawalnagar (10.1%).

In NWFP high HBV prevalence was seen in Upper Dir (5%), Lower Dir (3.2%) and Bannu (2.7%) and high HCV was seen in Hango (6.4%), Swat (3%) and Battagram (2.7%).

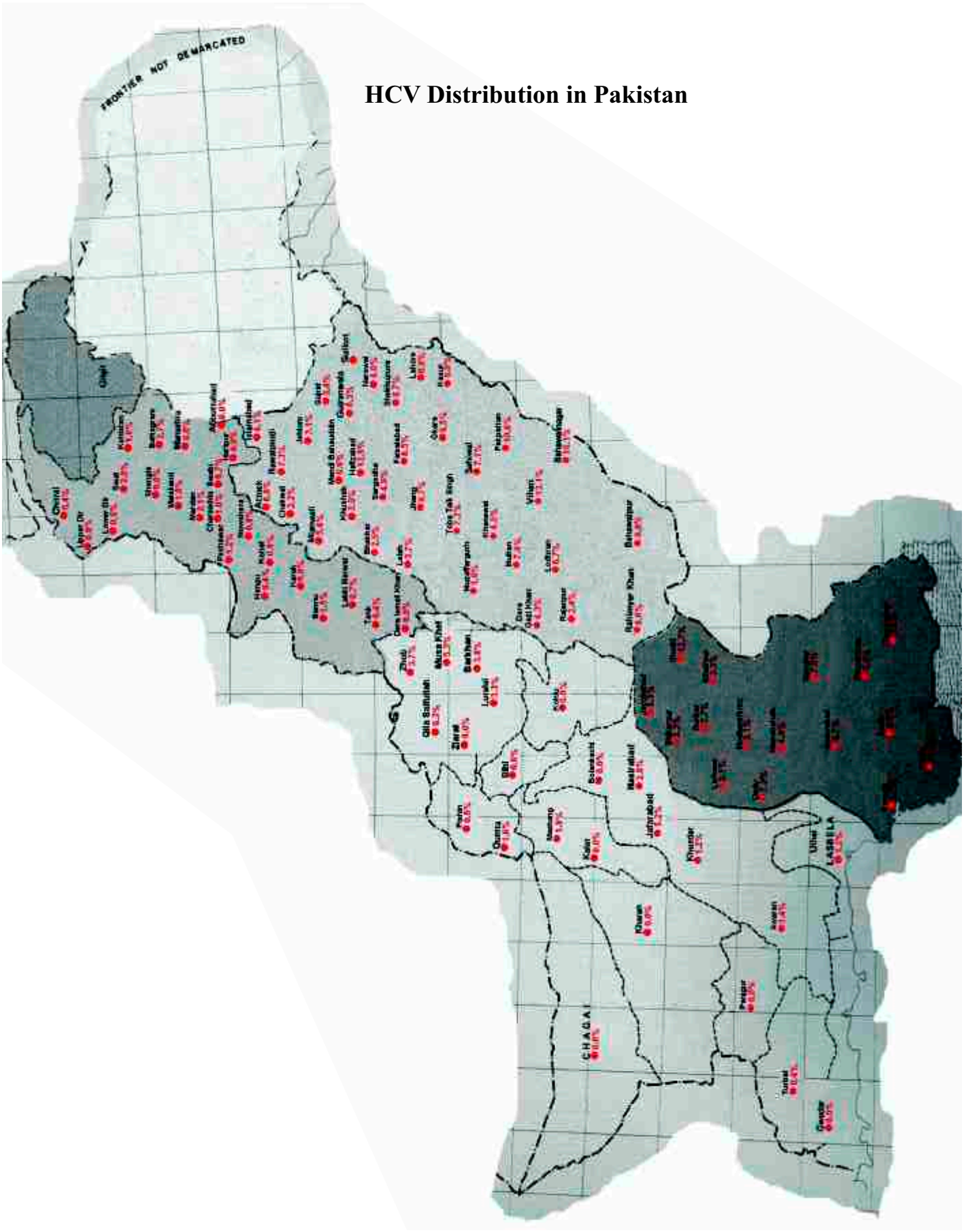
In Balochistan high figures for HBV were seen all over the province with very high prevalence in Musakhel (14.7%), Loralai (7.4%) and Sibi (7.3%). High HCV figures were seen in Musakhel (5.3%), Jafarabad (5.2%) and Barkhan (3.8%).

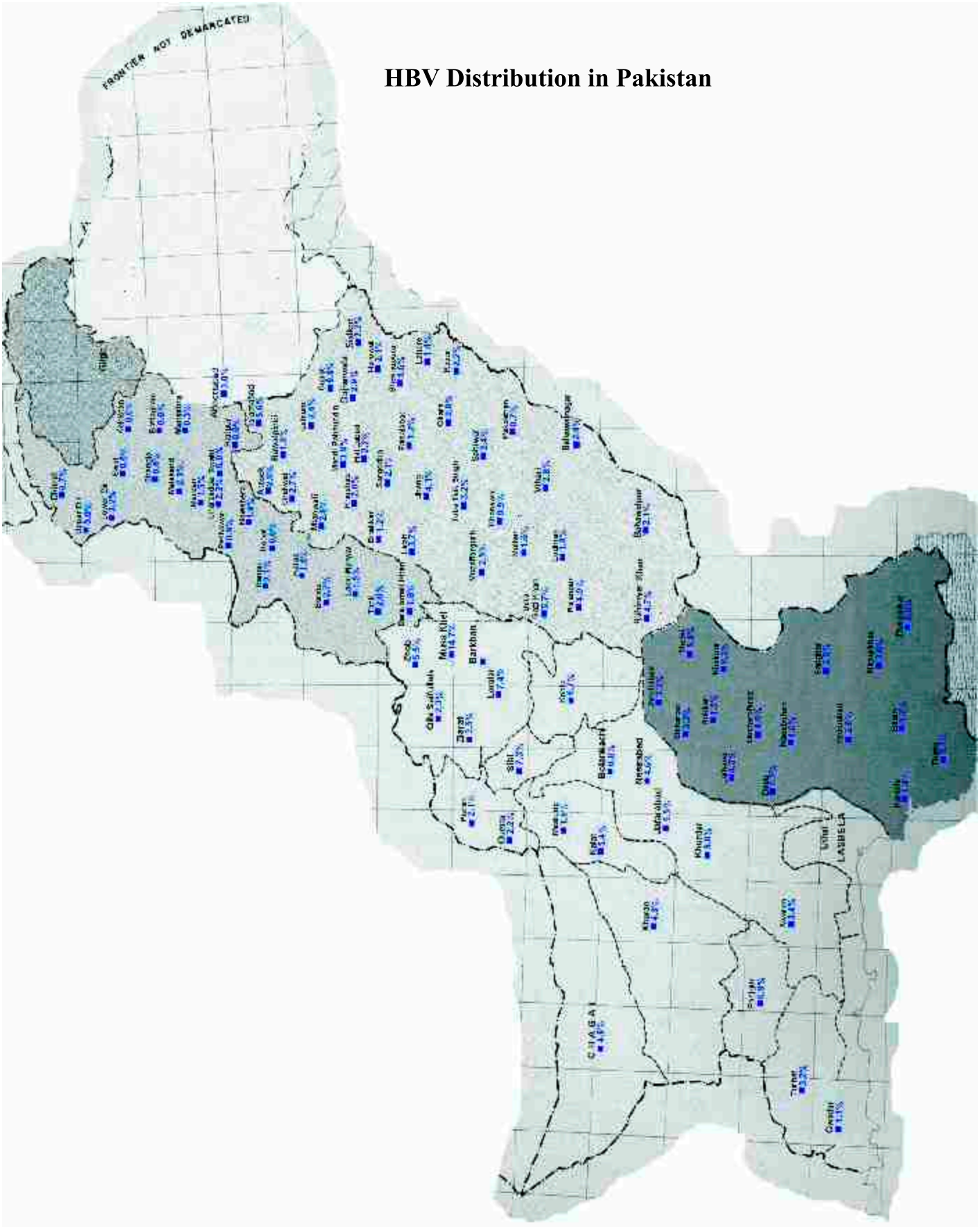
Gender showed slight preponderance of males for HBV all over Pakistan but no difference was seen in HCV. HBV distribution in Balochistan showed 5.2% disease prevalence in males and 3.4% in females. High HBV prevalence among females in Balochistan indicates a large reservoir of disease resulting in either horizontal or possibly vertical transmission.

With the advancement of age the HCV exposure seems to be increasing showing old exposure plus addition of new cases. The HBV exposure in younger population is low suggesting protection through vaccination.

Therapeutic injection use due to various ailments was high and showed strong positivity to HCV prevalence. About 30% of the screened population was taking more than 5 injections per person per year. With the increasing numbers of injections per person per year the exposure rate also increased. The positivity of HCV was twice more in those where a syringe was reused.

To control the disease in Pakistan, one has to increase the hepatitis B vaccination in newborns and high risk groups. For HCV the use of therapeutic injections has to be curtailed to a minimum of 3-4 injections per person per year with stronger injection safety measures.


HCV Distribution in Pakistan
FRONTIER NOT DEMARCATED
CHAGAI


HBV Distribution in Pakistan
FRONTIER NOT DEMARCATED

Background

The Standing Committee on Economic Affairs and Statistics had asked the Statistics Division to do a survey on the prevalence of hepatitis, HIV/AIDS and hypertension, as these cases were on a rise. First consultative meeting on this issue was held between Mr. Asad Elahi, Secretary Statistics, Dr Huma Qureshi, Executive Director, Pakistan Medical Research Council, Dr Mubashir Ahmad Khan, Principal Research Officer, Pakistan Medical Research Council, Dr Sania Nishtar, President Hearfile and a representative from National Program on HIV/AIDS.

During this meeting and further many meetings it was decided that HIV/AIDS screening is done on voluntary basis and the program was already collecting data using this approach therefore there was no need to do survey on this sensitive issue and people will not volunteer to be checked using blood screening on the spot. For hypertension there was already enough data available to calculate the disease burden, therefore again no requirement was felt to do a survey on urgent basis.

As hepatitis was on a rise and there were no prevalence data available therefore it was decided to carry out a prevalence study on hepatitis B and C in the whole country with the help of Federal Bureau of Statistics who shall take out the sample size and mobilize its teams to coordinate with PMRC and the survey teams in identifying the house, the head of the household and information on number of family members.

Introduction

Hepatitis B and C viruses spread through blood and body secretions. These viruses have infected mankind for centuries but hepatitis B virus was discovered in 1970s and hepatitis C in 1990s.

Both viruses have an acute illness where patients have acute jaundice and very high serum ALT (a part of liver function tests). In majority (90%) of adults, acute hepatitis B resolves within 2-3 months with full recovery. The scenario is different in new born and up to 5 years of age where full recovery is seen only in 10% while 90% develop chronic liver disease. In acute hepatitis C full recovery occurs in only 20-30% of cases while70-80% require treatment for clearance of disease as they may go on to develop chronic liver disease.

If the mother is HBsAg positive and is also positive for HBeAg (a marker for infectivity) than there is a 90% chance that she will transmit the disease to her newborn. If the mother is HBsAg positive and not HBeAg positive, than the probability goes down to 20-30%.

It is therefore mandatory to check pregnant mothers for these 2 viruses. For the former scenario the newborn has to receive 2 immunizations within 24 hours of birth, the hyper immune globulin at one site and the hepatitis B vaccine at another site. For the latter group only hepatitis B vaccine is recommended.

Exposure of the virus in the neonatal period

Due to poorly developed immune system the body is unable to produce antibodies against the virus, so the virus stays within the body; without producing any damage to the liver. These cases have the HBsAg in the blood for life but their liver function tests remain normal all through life and all markers that show viral activation are absent in these cases. Exposure to the virus between 2-5 years of life is dangerous because the body's immune system is partially developed. The body produces inadequate antibodies against this virus; which are not adequate enough to throw the virus out nor are low enough to not to produce a reaction. This low-grade reaction produces chronic liver disease in these children, which persists for life.

Majority of adult hepatitis B cases that we see are children and neonates who have been exposed to this virus in early life and have carried the virus due to reasons mentioned above.

Once a person has 2 positive reports of HBsAg 6 months apart, than there is almost a 100% chance that this individual will carry the virus for life and will always be found positive on tests whenever tested. Natural seroconversion over years occurs in 5-20% cases in each country depending upon the genes and genotypes of HBV.

Once exposed to hepatitis B virus, antibodies develop naturally in over 90% adults within 6 months of exposure. Vaccination also produces antibodies in over 90% of the

cases. Antibodies (Anti HBs) once produced either following natural recovery or following vaccination persist for life, though their levels may go down with time. Any exposure to the virus any time after production of antibodies will automatically enhance antibody production during that period to protect the individual. Booster dose is therefore not required as a routine in most cases.

Majority of the cases with hepatitis C virus get infected without any history of jaundice or liver disease. During acute infection, which is noticed in 20% cases, the individual has jaundice and raised ALT. Anti HCV becomes positive after 6 months of exposure so this test should not be used for the diagnosis of acute hepatitis. On the contrary if this test is found positive in an otherwise acute case than the diagnosis of acute hepatitis C should be excluded.

The acute infection clears in 20-30% cases while in the rest it persists as chronic hepatitis C. It is a very slowly progressing disease and in about 25% cases over 10 years it progresses to chronic liver disease and over another decade in 25% it goes to advanced disease.

Anti HCV is a marker of exposure and it will remain positive for life, its presence does not confirm disease. PCR defines active disease.

Subjects and Methods

Sample Size

Universe: The universe consists of all urban and rural areas of the four provinces of Pakistan defined as such by 1998 Population Census excluding FATA, Military restricted areas of NWFP. Thus population of excluded areas constituted about 3% of the total population.

Sampling Frame: Federal Bureau of Statistics has developed its own sampling frame for urban area. Each city/town has been divided into a number of enumeration blocks (E.B). Each enumeration block consists of 200 to 250 households on the average with well-defined boundaries and maps. The lists of enumeration blocks updated in 2004 and the lists of villages/mouzas/dehs published/prepared by Population Census Organization were used as sampling frame. Enumeration blocks and villages were considered as Primary Sampling Units (PSUs) from urban and rural domain respectively.

Stratification Plan

a) Urban Domain

i. **Large Sized Cities:** Each of Karachi, Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan, Hyderabad, Sukkur, Sargodha, Bahawalpur, Sialkot, Peshawar, Quetta and Islamabad have been considered as large sized city. Each of these cities constitutes a separate stratum which has been further sub-stratified according to low, middle, high income groups based on the information collected in respect of each enumeration block at the time of demarcation/updating of urban area sampling frame.

ii. **Remaining Urban Areas:** After excluding the population of large sized cities from the population of respective administrative division of a province, the remaining cities/towns have been grouped together to form a stratum called other urban areas. Thus each division in remaining urban areas in the four provinces constitutes a stratum.

b) Rural Domain

In rural domain, each district in the Punjab, Sindh and NWFP provinces has been considered as independent and explicit stratum whereas in Balochistan province each administrative division constitutes a stratum.

Sample Size and it's Allocation

Considering the variability for the characteristics for which estimates are to be prepared, population distribution and field resources available, a sample size of about 7000 sample households (SSUs) have been considered appropriate to provide reliable

estimates of key variables at National and Provincial level with desired reliability constraints.

The entire sample households (SSUs) have been drawn from 350 Primary Sampling Units (PSUs) out of which 138 are urban and 212 are rural. As urban population is more heterogeneous therefore, higher proportion of sample size has been assigned to urban domain. Similarly NWFP and Balochistan being the smaller provinces and to get reliable estimates for these provinces higher proportion of sample has also been fixed to these provinces. After fixing the sample size at provincial level, further distribution of sample PSUs and SSUs to different strata in rural and urban domains in each province has been made proportionately, keeping in view the minimum requirement of each stratum.

The distribution of sample PSUs and SSUs in the urban and rural domain of the four provinces is shown in **Table 1.**

Table-1: PSUs and SSUs in the urban and rural domain of the four provinces

Province	Sample PSUs			Sample SSUs		
	Total	Urban	Rural	Total	Urban	Rural
Punjab	175	68	107	3500	1360	2140
Sindh	78	38	40	1560	760	800
NWFP	55	17	38	1100	340	760
Balochistan	42	15	27	840	300	540
Total	**350**	**138**	**212**	**7000**	**2760**	**4240**

Sample Design

A stratified two-stage sample design was adopted for the survey.

Sample Selection Procedure

a) **Selection of Primary Sampling Units (PSUs):** Enumeration blocks in urban domain and villages/mouzas/dehs in rural domain were taken as primary sampling units (PSUs). In the urban domain, sample PSUs from each ultimate stratum/sub-stratum have been selected with probability proportional to size (PPS) method of sampling scheme. In urban domain, the number of households in enumeration block as per last updated list during 2004 and population of villages/mouzas/dehs according to population census 1998 have been considered as measure of size.

b) **Selection of Secondary Sampling Units (SSUs):** Households within sample PSUs have been taken as secondary sampling units (SSUs). A specified number of households i.e. 20 from each urban and rural sample PSU have been selected with equal probability using systematic sampling technique with a random start.

With each house having an average family size of 6.7 persons, in Punjab 3500 houses comprising of 23450 persons, in Sindh 1560 houses with 10452 persons, in NWFP 1100 houses with 7370 persons and in Balochistan 840 houses with 5628 persons were to be checked.

STAFF OF FBS

Contracting Firm

Using standard protocol of tender and selection of the best firm, Citilab of Rawalpindi/ Islamabad won the contract. The laboratory has 6 qualified postgraduate doctors looking after each section of the laboratory with over a dozen qualified technicians and many qualified phlebotomists and other support staff. A major part of the basement of the laboratory was converted and reallocated to the hepatitis survey with special fridges and freezers and centrifuge machines to cater the blood separation and storage. A 2 day's training workshop of the laboratory personnel was done by Executive Director, PMRC/ Project Director at different occasions to train the trainers.

CITILAB ISLAMABAD






Testing/Evaluation of Rapid Test Devices

As all tests were to be done in the field and reports given to the people there and then therefore it was mandatory that rapid whole blood device should be procured for the survey. There are variable qualities of rapid devices available in the country whose results vary from best to none. Therefore to tackle this issue first of all WHO approved rapid devices were searched and where WHO/EU certified devices were not available then other parameters like their use in international studies and their comparative test figures available on net were retrieved and compared.

Based on the above strategy the "**Determine" by Abbott** was approved for hepatitis B. This test is WHO approved with over 95% sensitivity and specificity, while for hepatitis C no device was WHO approved therefore the reliable companies were requested to supply 100 devices each for local testing on known ELISA positive and negative samples of hepatitis C cases at the department of blood bank and transfusion services of Jinnah Postgraduate Medical Centre, Karachi. Fresh samples of known positive and negative cases were supplied by the Specialized Centre for Gastroenterology and Hepatology of Pakistan Medical Research Council. Tests were done with serial dilutions for each sample. "Advanced quality" rapid test for HCV was finally selected and used.

Survey Forms

During the survey 5 forms were to be filled which comprised of a consent form, a household form, an individual form, a report and a referral form for those found positive for the disease. All these were translated into Urdu language to help interviewer in posing the right question to get the right answer. A reverse translation from Urdu to English was also done to check if the translated questions had the same message.

Pilot Testing

All these forms were tested in a pilot study on 10 houses in different vicinities of Islamabad and Rawalpindi. Few questions in the individual form and the household form were rephrased to get desired information. These forms were then retested and when found correct were finalized.

Training of the Trainers

In the training all participants were appraised about the current situation of hepatitis B and C in the country and how the transmission occurs and how disease spreads.

TRAINING AND PRE TESTING













Six forms/brochures were made which included:

1. Information brochure
2. Consent form
3. House hold information form
4. Individual form
5. Report form
6. Referral form

Trainers were trained on the **information brochure**, which was given to the head of the family to make him aware about the disease and its modes of spread and consequences. It also gave them information that the Ministry of Health, Government of Pakistan was extending help to get right figures about disease prevalence.

The **Consent form** was to be signed by the head of the household or a senior member of the family and either signature or a thumb impression was taken in front of 2 members of the house and the team leader.

The **house hold information form** contained information on water and sanitation facilities, number of household members in the house, their relation to the head of the household. Information was also collected on the age, gender, education and employment status of the family members. This information was gathered to know about number of members present in the house, because all members of the family were to be checked for the disease irrespective of the age and gender.

A separate **individual form** was filled for each member of the house to get first hand information about their present and past infection with hepatitis and the possible risk factors for its transmission. Special questions were posed for sharing the toothbrushes and the razors and the use of injections for common ailments and whether a new syringe is used or a re used syringe is used. Individual form of each person was filled irrespective of whether he/she was present at that time or not to know the family size and their health status and the health seeking behavior.

PROFORMA FILLING



























A **report** was given to all persons who gave blood for testing. All reports of the whole house hold members were handed over to the head of household or a senior person of the head of the family.

Referral form was filled for all those cases that were found positive. They were referred to the nearest functioning site of the Prime Minister's Program on the control of hepatitis for confirmation of disease by ELISA and treatment if required.

REPORT DELIVERY





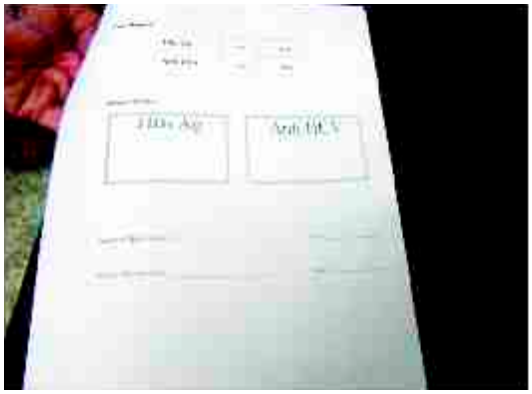


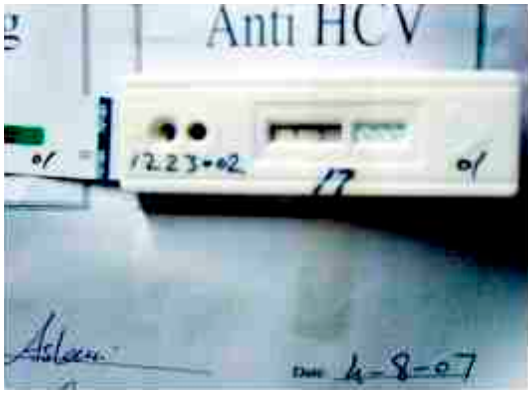

Training of Phlebotomists

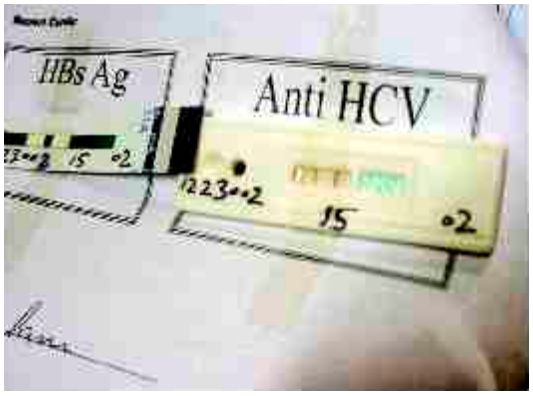
All technicians were trained on taking out the blood sample from the vein and through the prick in case of infants and newborns. Though all laboratory technicians were already trained to collect blood but to maintain standardization a uniform training was done for all technicians. All technicians were made to run at least 2-3 hepatitis B and C rapid tests using whole blood as almost all of them were trained on performing the rapid test with serum and not whole blood. Special training was done on marking the names of the individuals on the devices and on the storage gel tubes where the PSU code was written along with house number and the person number and name. The tested rapid blood kit/devices once checked were pasted on the individual report forms to keep a record. The reports were also written on the back side of each individual form in pre assigned box, so that if the devices are lost the written report remains.

Blood was collected in gel tubes for further testing and serum separated and stored.

FIXING OF DEVICES ON PROFORMA






HBs Ag
Anti HCV
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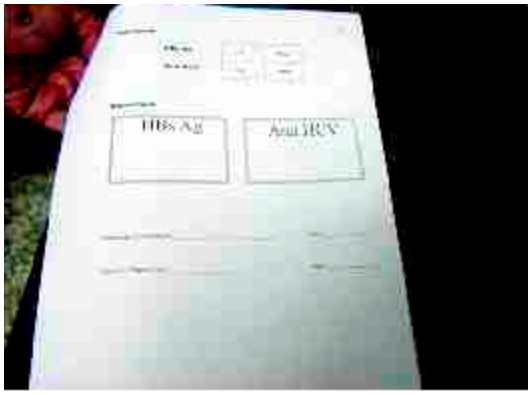
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Anti HCV


Anti HCV
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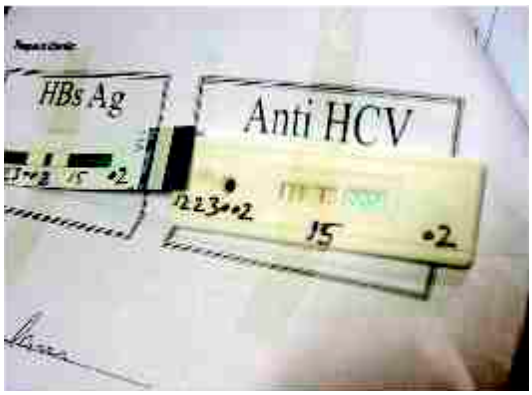
HBs Ag
Anti HCV
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Interpretation of rapid tests

HBsAg rapid test

A drop of whole blood from the syringe was dropped on the gauzy end of the strip. A drop or two of chase buffer were added onto the drop of blood. Within 1-2 minutes the results are available. If two red lines were seen one against the mark "Patient" and other against mark "C" than the test was read as positive. The "P" signifies the test case and "C" as control. If only one red line was seen across the "C" with no red line against the "P" than it was interpreted as a negative case. It was mandatory that a red line appeared on the control site to confirm that the device is active. If no red line was seen at "C" than the test had to be repeated.

Anti HCV raid test

A drop of whole blood from the syringe was dropped in the small well and a drop or two of chase buffer was placed in the larger well, which was behind the smaller well. The chase buffer flows through the smaller well and thus carries the blood to the test/agglutination site. Wait for 1-2 minutes. If two red lines appeared in the oval window one against the mark "C" and the other against the mark "T" than the test was interpreted as positive while if only one line appeared on the "C" or control mark and no line appeared on the "T" or test than it was interpreted as negative test. A red line was mandatory to appear on the control mark, otherwise the test had to be repeated. For HBeAg testing, Abbot Chemiluminescence's technology was used in sera stored from these cases.

Training of teams by trainers

Once trainers were trained, they trained their own teams but PMRC scientists were always present while training of the teams was being done to assure proper and standardized training and thus reliable results.

Route landmarks to reach PSU

Teams were instructed to maintain a diary of the route to the PSU, with instructions to make reference to schools, shops, mosques or other places of importance. They were also trained to mark the house with the PSU number on some prominent spot of the house with "HEP" as initials for the survey. They were also trained to visit either EDO health or Nazim or naib Nazim or a senior person of standing of that PSU prior to starting the survey and take them into confidence and do the survey with their consent and participation. Pictures were also taken to keep a record.

The head of the team or the supervisor was asked to visit the local FBS office and meet the statistical assistant. The statistical assistant provided them with the recent listing of the houses and also took the team members to the identified houses that were selected using the random number by the statistics assistant. The FBS assistant also provided the names of the head of the households to ease identification of the correct house.

LANDMARKS






Composition of Teams

Each team had 3-4 members of whom there was 1 male supervisor whose job was to introduce the team and the survey information to the head of household and fill the household form. A male and female phlebotomist meanwhile filled individual forms of males and females and children (for children the help of mother or an elder were taken).

BLOOD COLLECTION & TESTING

































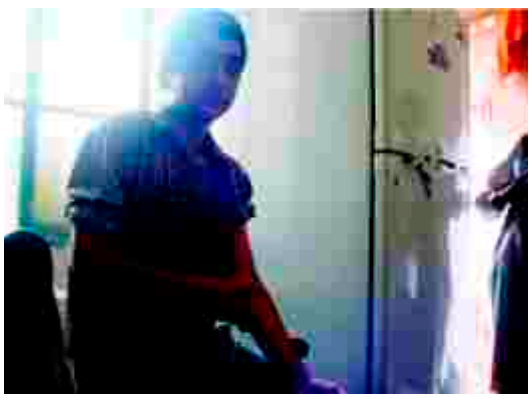












Rapid device blood testing

Once the forms were filled, then blood tests were run in a row on all individuals in the house. One drop of whole blood was placed on the identified spot of hepatitis B device and one drop placed in the small well in hepatitis C device. One to two drops of respective chase buffer was instilled over the specified spot of the device. Test results were usually available within a minute but final check was done after 15-20 minutes while still in the house and reports were given before leaving the house. For the testing and participation of members who were absent, the head of the house was informed of the next house where the team was going and the likely time when the team would pass by their house on way back. This was done to maximize the participation.

Final Packing of forms

Forms of each house hold including 1 household form, all individual forms and 1 consent form were stapled together and placed in a polythene bag, which was sealed. The house number, PSU number and the number of forms in envelop were marked over the envelope with a marker.

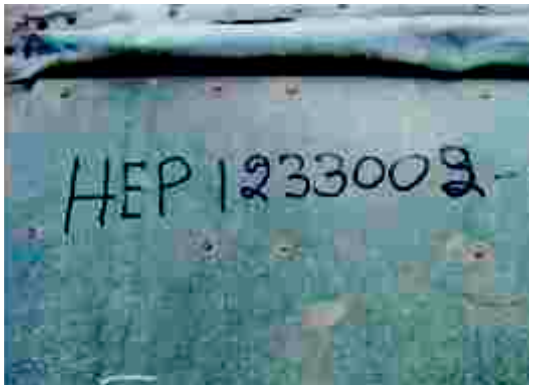
Marking of house after completion of survey

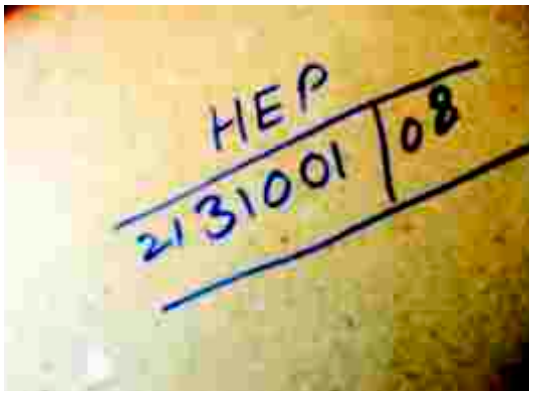
To confirm that the selected house participated in the survey, the front door or a prominent place in the house was marked with a permanent marker using abbreviations of the survey, the 8 digit PSU number and the 2 digit house number.

NUMBERING OF HOUSES



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The remaining blood after performing the rapid tests was collected in blood gel tubes which were kept in cool box with ice packs to keep them cold and prevent hemolysis. The gel bottles were also marked with the name of the individual, the PSU number, the house number to ease in its identification. All forms along with blood were deposited at the closest TCS office for onward transmission to Citilab Islamabad.

STORAGE OF DATA AT PMRC

Telecommunication Network

All the heads of the teams were in constant contact with the Citilab supervisor and the doctors through mobile phones for any queries, deficiencies in the supplies and

problems in running the tests (extremes of temperatures). These issues were resolved round the clock by the lab supervisor and the heads to ensure smooth running of the survey. A good coordination was ensured between the teams, the Citilab and PMRC.

Temperature Variations

During periods of extreme temperatures like very hot or cold climates which were faced by the teams during the survey, known positive and negative tests were sent by the Citilab to run a recheck of the devices before going in the fields. At times of extreme cold (snow and chills), the device had to be charged with the chase buffer before pouring blood, otherwise blood would clot on the device and not move in the channel.

EXTREME TEMPERATURE & HARSH AREAS











The Final Survey

Teams were instructed to visit all identified 20 houses and not to go for substitutes for houses which were locked or people had migrated or where members were non compliant. If there were many refusals or people were non-compliant then FBS was informed and they either gave a new PSU or supplied a new house numbers with the help of local FBS.

TEAMS IN THE FIELD















Handling of specimens and forms at Citilab

Upon receiving a consignment from TCS, the persons in the laboratory were deputed to look into the forms for completeness of information and cross checking the names of individuals on the forms with their devices and the blood gel bottles. The PSU name, house number, individual number on the blood gel bottle along with the name of the person was confirmed. Blood gel bottles were placed in a centrifuge and serum separated and stored in 2 aliquots with identical sticker being applied to both bottles having all information of PSU, house number and name of person. Two aliquots were used to facilitate defrosting of one bottle at a time for further tests while preserving 1 bottle of serum as reserve. The serum was never separated with a separator and was always poured into the aliquots to avoid any chances of cross contamination or infection. Any deficiency in the forms or blood tubes was checked there and then and the teams were informed accordingly so as to prevent them from making the same mistakes or oversight. Teams were instructed to not to litter the house with the test wrappers and swabs while testing. All litter was collected in a large polythene bag and this was finally buried at the end of the day. All syringes were cut with a syringe cutter and cut needles were buried in the ground.

Software Development

All information in the forms was transferred to the computer using a special program prepared for the survey. Changes were made in the software program 2-3 times to facilitate the proper filling of the forms. All forms once entered were again placed back in the same polythene bag and sealed and kept in the store.

LABELING OF SAMPLE & KITS






Monitoring Survey Teams

Monitoring teams were developed by PMRC. Senior officers of the council, who were well versed with the project, were deputed to monitor the survey teams while they were in the fields. Random sites were selected using computer generated random tables. Monitoring was done to check that teams reached the same PSU as was selected and did not select a close by locality. It was also done to see that only identified houses are visited and checked and lastly that filling of questionnaire and blood testing was done as desired and trained. Any minor deficiencies when found were straight away pointed to the team supervisor and information sent to main Citilab at Islamabad. Major deficiencies like avoiding venous puncture and performing prick, or showing fewer members in the houses to reduce workload and not convincing parents to get children checked were taken seriously and teams were stopped to work and replaced with new members.

At most places the monitoring teams went separately from the teams that were already in the fields and checked them unawares. At some places that were very far away and where transportation was a major issue, than both went together and the monitoring team stayed with the survey team all through the testing. This strategy was specially devised for Balochistan where places were far away and difficult to locate without the help of statistical assistant who was accompanying the survey team.

MONITORING OF SURVEY

























Results

The survey was started in July 2007 and completed in May 2008. Out of a sample size of 47000 individuals from 350 PSUs, a total of 47043 individuals were tested from all 350 PSUs. It is worth mentioning that during the survey which lasted for about one year, the teams faced extremes of heat and cold with harsh rains and snow. The law and order situation in NWFP and Balochistan was far from satisfactory and even local population was migrating to safer areas. Two PSUs in NWFP and 1 in Balochistan had to be changed due to unstable law and order situation while 2 in Sindh were changed following floods in Sindh. Despite all these natural and man-made constraints the teams visited all PSUs and collected samples and information from over 95% population in these trouble hit areas. At many places the teams had to work till late mid night to complete the PSU as there were no lodging facilities and coming back the next day to the same PSU was impossible. No where the teams felt threatened or lonely; infact at most places very friendly and helping people we found through out the country who accompanied the teams and helped them in identifying the houses and locating the individuals. Food, refreshments, security and shelter were offered by almost all houses and at many places the individuals appreciated the efforts done by the government and the team members to come to their houses and test them free of cost and give them instantaneous results.

The shortfall of 4% was due to the migration of the individuals, non availability of the household members and the refusals. In actuality the teams tested an extra of 800 cases who were not included in the survey but demanded tests in return of extension of their services in locating the houses, political pressure and disease/death in immediate family members, but these tests were not included in the analysis.

Housing and Household Information

Housing material

Of the total 7000 houses visited, 32% houses were made of mud (kacha), 45.4% were made of bricks and walls were plastered (pacca), 19.3% were semi Pacca. Only 3.3% houses were pacca and well furnished.

Ownership

Majority of families (87.6%) owned the house, in which they were living, while 8.2% were living in a rented house, 4.2% were living in a rent free house.

Source of drinking water

There was piped drinking water in 52.7% houses, while 21.8% got water from a public tap, 9.7% were using well water, 5% were getting from a spring or pond or river and 10.8% were getting it through vendors like tankers, carts.

Toilet facility

Flush toilet was available at 55% sites, while 18.5% were using a pit latrine. Over a quarter of the population screened (26.5%) had no toilet facility and were going in fields for the call of nature.

Education level of the screened population

Majority (44.4%) individuals screened were totally illiterate and this percentage does not include children (3.4%) who were too young to go to school. About 17% people were educated to less than primary level, 8.8% were primary school passed, while 5.6% each were educated less than middle (class VIII) and middle passed whereas 7.1% were matric passed. Four percent were intermediate passed and 4.3% were graduates.

Business engagements

Majority (41.4%) of the population screened were working within the house, this included 19.3% housewives while 22.1% male members of the house were also working the house and were not employed or working somewhere. Students accounted for 25.2% of the population. Professionals/private job workers, business men were 12.5% and 3% were government employees. Rest was unskilled or daily wageworkers.

Present or past history of jaundice

Majority of the individuals were not jaundiced when interviewed or screened for blood testing for hepatitis B and C.

Past history of jaundice was recalled in only 3% individuals while 97% never had jaundice.

Source of creating awareness about hepatitis

Individuals were asked about the source through which they became aware about hepatitis as a liver disease. Fifty-four percent individuals were unaware about hepatitis causing liver disease. Media played a role in creating awareness about hepatitis in 22% cases that came to know about this disease through television while 2% each got information through newspaper or radio. About 13% got information through relatives or friends and only 7% came to know about hepatitis through their doctor.

Family history of liver disease and death due to liver disease

Information was gathered from the head of the household about any family member suffering from hepatitis. Only 3% affirmed that some of their family members were suffering or had suffered from liver disease in the past.

Of HBV positive cases, there were deaths in 17 family members (1.5%), which

included death of father in 5, wife in 2, mother, sister, daughter, brother in 1 case each and 6 in other relatives. A total of 496 deaths due to liver disease were reported in the families of people who were screened for hepatitis B or C. Of the deaths, there were more deaths of males than of females. There was death of the father in 84 cases, brother in 37, husband in 23 and son in 20 cases. Of females 37 mothers, 39 wives, 9 sisters and 2 daughters of the household head died. Other family members (245) who died were aunts/uncles, nieces nephews and others.

National Prevalence of HBsAg and anti HCV in Pakistan

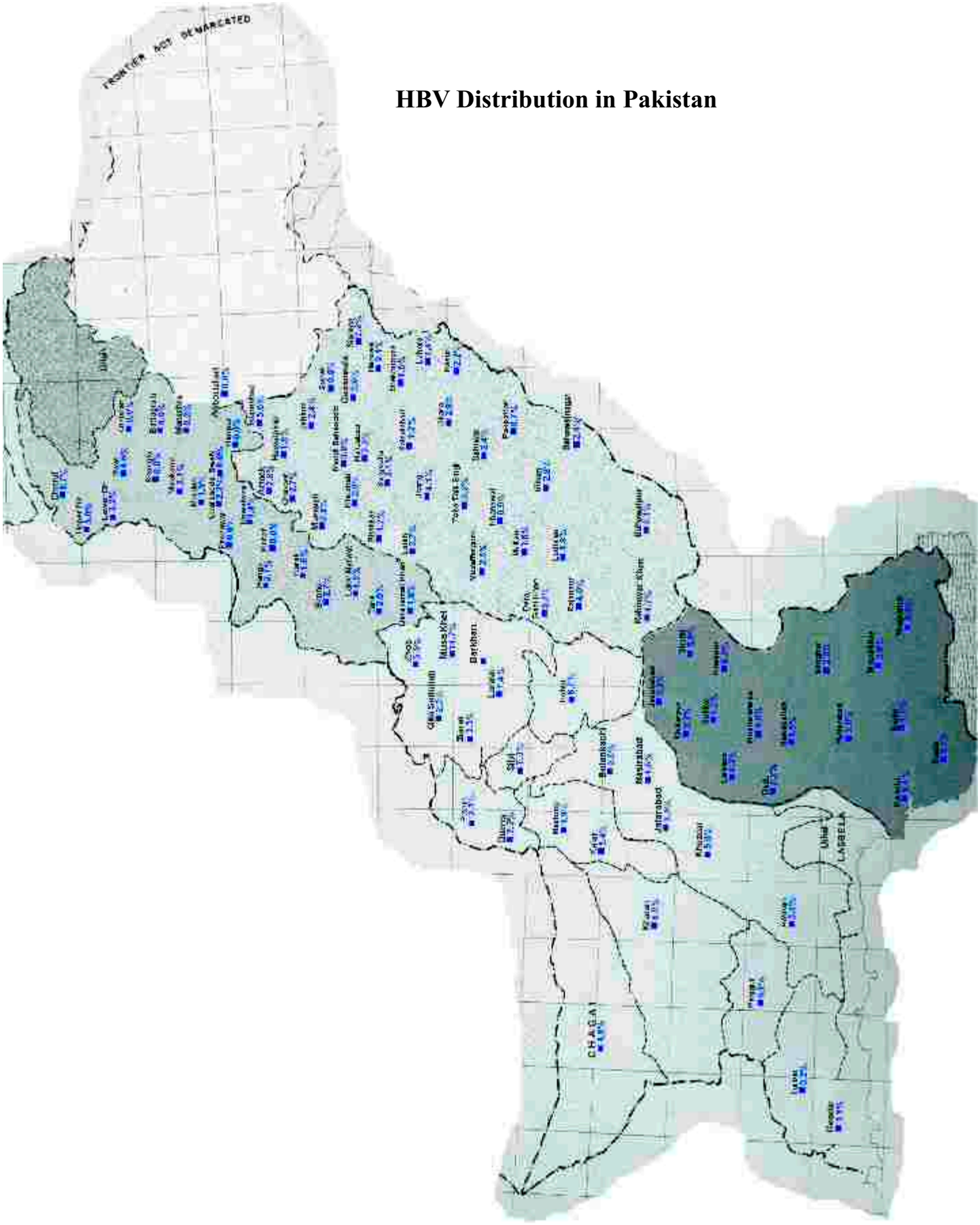
The scatter of HBV and HCV prevalence all over Pakistan is shown in the accompanying figures.

The overall HBsAg prevalence was 2.5% and anti HCV prevalence was 4.9%. The gender distribution is shown in **Table 2.**

Table 2: Overall national prevalence for HBsAg and anti HCV in both gender

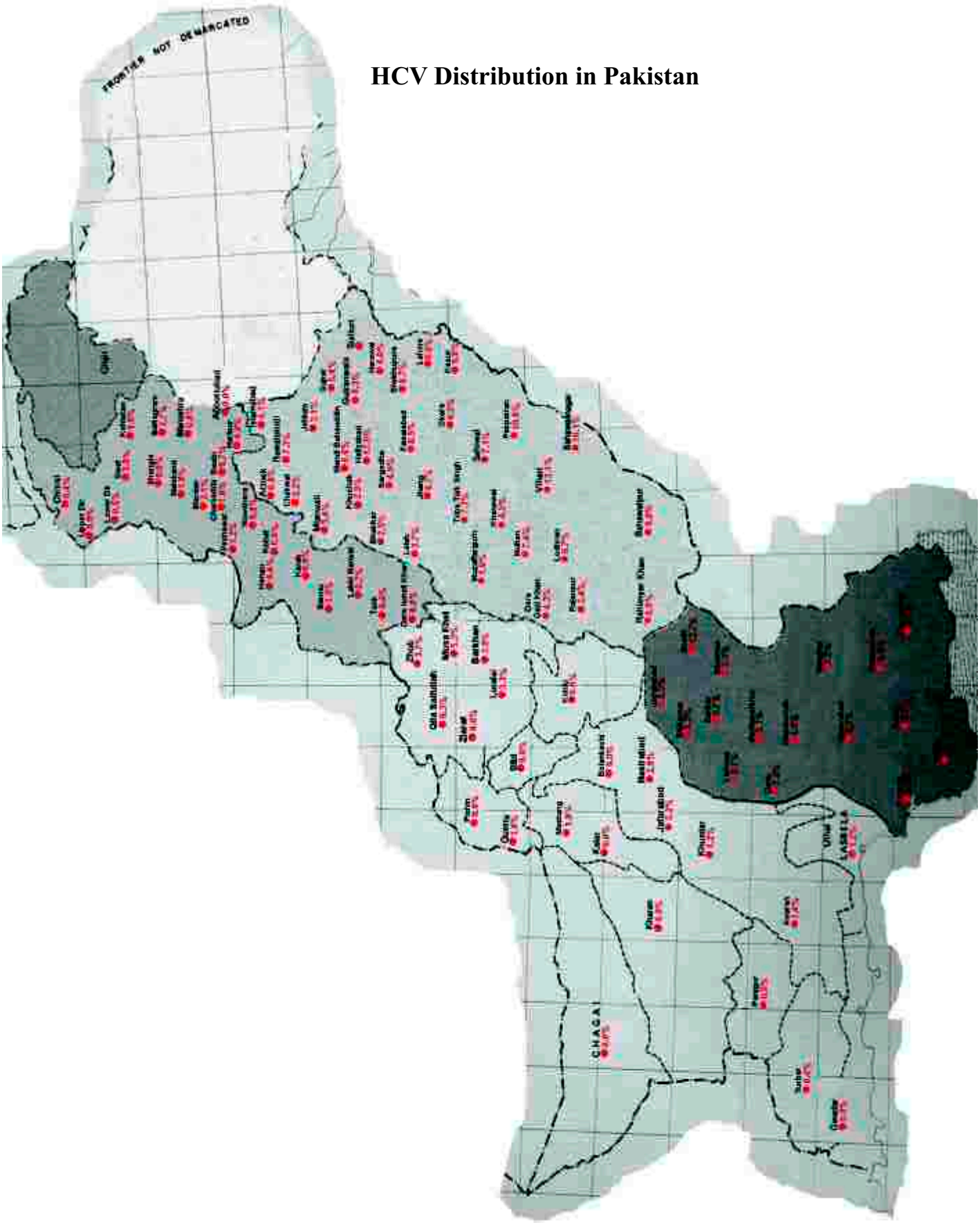
Test Results	Overall		Male		Female	
	No	%	No	%	No	%
HBsAg Positive	1156	2.5	709	2.9	447	2.0
Anti HCV Positive	2294	4.9	1204	4.9	1090	4.8
Both Positive	97	0.1	50	0.2	47	0.2
All negative	43496	92.5	22481	92.0	21015	93.0
Total	**47043**	**100.0**	**24444**	**100.0**	**22599**	**100.0**

For the sake of analysis and clear understanding about both hepatitis B and C, the results of HBV and HCV have been separated.



HBV Distribution in Pakistan

HCV Distribution in Pakistan



Prevalence of HBsAg in the Population

The prevalence of HBsAg in the four provinces with 95% confidence interval is shown in Table 3(a). The HBsAg prevalence was highest in Balochistan (4.3%). The over all prevalence of HBV in the population was 2.5%.

Table 3 (a): Prevalence of HBsAg in all Provinces

Province	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
Sindh	8909	227	2.5	2.2 – 2.9
Punjab	25206	606	2.4	2.2 – 2.6
NWFP	7637	97	1.3	1.0 – 1.5
Balochistan	5291	226	4.3	3.7 – 4.8
Total	**47043**	**1156**	**2.5**	2.3 – 2.6

As no rapid test was available for the detection for HBeAg in the field, therefore this test was run on blood samples which were brought for future analysis. Abbott chemiluminescence's technology was used for HBeAg testing and all samples were run in Citilab while kits were provided by PMRC.

Prevalence HBeAg in HBsAg positive cases

Overall HBeAg prevalence was 14.5%, with highest results of 17% from Balochistan, followed by 15.4% from Sindh, 14.2% from Punjab and 8.5% from NWFP Table 3(b). These figures show that perpetuation of HBsAg will continue for a long time in our population especially from females of reproductive age. As over 90% of the children born to HBeAg positive mother shall have the disease transmission from their mothers therefore majority of these children will end up having chronic liver disease later in life.

Table 3(b): HBeAg in all Provinces

Provinces	HBsAg Positive	HBeAg tested	HBeAg positive (%)
Sindh	227	143	22(15.4)
Punjab	606	444	63(14.2)
NWFP	97	59	05(8.5)
Balochistan	226	141	24(17.0)
Total	**1156**	**787**	**114(14.5)**

The male and female prevalence of HBsAg with 95% confidence interval is shown in **Table 4.**

Table 4: Prevalence of HBsAg according to gender

Gender	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
Overall	47043	1156	2.5	2.3 – 2.6
Male	24444	709	2.9	2.7 – 3.1
Female	22599	447	2.0	1.8 – 2.2

Prevalence of HBsAg in different age groups

Of the total 47043 individuals screened only 3.1% (6085) were children (less than 19 years) and rest 97% were adults. The marker prevalence in different age groups is shown in **(Table 5)**.

Table 5: Prevalence of HBsAg according to age

Age in years	No. of Subjects	Prevalence of HBsAg		
		No	%	95% Confidence Interval
Under 5 years	4188	53	1.3	0.9 – 1.6
5-19	18397	329	1.8	1.6 – 2.0
20-29	8580	192	2.2	1.9 – 2.6
30-39	5770	187	3.2	2.8 – 3.7
40-49	4453	167	3.8	3.2 – 4.3
50-59	2800	116	4.1	3.4 – 4.9
60 & above	2777	112	4.0	3.3 – 4.8
Don't know	78	-	-	-
Total	47043	1156	2.5	2.3 – 2.6

For HBsAg a plateau of less than 2% was seen from birth to 20 years of age after which there was a slight increase in the number of cases.

Rest of the population showed a slightly higher figure reaching to a maximum of 4.1%**.** These are probably the individuals who had been exposed to the virus in the past. This scenario will persist till about next 30-40 years when this group shall gradually fade out and shall be replaced by the vaccinated group.

To see if the drop in HBV was actually due to EPI vaccination (hepatitis B vaccine was included in the EPI in year 2000), when all children less than 8 years of age were excluded then the prevalence figures are shown in **Table 5a**.

Table 5a: Prevalence of HBsAg - Excluding less than 8 years children

	Overall		Male		Female	
	No.	%	No.	%	No.	%
Pakistan	1075	2.6	659	3.1	416	2.1
Punjab	568	2.5	336	2.8	232	2.2
Sindh	206	2.8	142	3.7	64	1.8
NWFP	92	1.5	56	1.7	36	1.1
Balochistan	209	4.8	125	5.8	84	3.9

The exposure of HBsAg virus was seen in both gender to see any gender related trends (**Table 6).** The HBsAg showed a male predominance and a rising trend with the advancing age and reached to as high as 5.5% at 50-59 years age.

Table 6: Prevalence of HBsAg according to age in males

Age in years	Male				Female			
	No. of Subjects	Prevalence of HBsAg			No. of Subjects	Prevalence of HBsAg		
		No	%	95% Confidence Interval		No	%	95% Confidence Interval
Under 5 years	2121	33	1.6	1.0 – 2.1	2067	20	1.0	0.5 – 1.4
5-19	9645	198	2.1	1.8 – 2.3	8752	131	1.5	1.2 – 1.8
20-29	4337	104	2.4	1.9 – 2.9	4243	88	2.1	1.6 – 2.5
30-39	2838	106	3.7	3.0 – 4.4	2932	81	2.8	2.2 – 3.4
40-49	2319	104	4.5	3.6 – 5.3	2134	63	3.0	2.2 – 3.7
50-59	1486	82	5.5	4.4 – 6.7	1314	34	2.6	1.7 – 3.4
60 & above	1647	82	5.0	3.9 – 6.0	1130	30	2.7	1.7 – 3.6
Don't know	51	-	-	-	27	-	-	-
Total	24444	709	2.9	2.7 – 3.1	22599	447	2.0	1.8 – 2.2

Overall the prevalence of HBsAg was significantly higher ($p<0.01$) in males when compared to females in all age groups

Prevalence of HBsAg with marital status

Relation of marital status to the exposure to these viruses showed a significantly higher ($p<0.01$) exposure in the married group than in the never married group **(Table 7)**.

Table 7: Prevalence of HBsAg according to marital status

Marital Status	No. of Subjects	Prevalence of HBsAg		
		No	%	95% Confidence Interval
Never Married	28015	481	1.7	1.6 – 1.9
Married	17975	641	3.6	3.3 – 3.8
Div. /Sep. / Widow	1053	34	3.2	2.2 - 4.3
Total	47043	1156	2.5	2.3 – 2.6

The prevalence for hepatitis B virus jumped from 1.7% in never married group to almost twice (3.6%) in the married group. When children less than 20 years were excluded from the never married group, then even the high prevalence persisted in the married group **(Table 8)**.

Table 8: Prevalence of HBsAg according to marital status in 20-49 years of age group

	HBsAg (Age 20- 49 years)				HBsAg (Age 20- 49 years)			
	No. of Subjects	Male			No. of Subjects	Female		
		No	%	95% Confidence Interval		No	%	95% Confidence Interval
Married	5813	245	4.2	3.7 - 4.7	6934	193	2.8	2.4 - 3.2
Never Married	3607	67	1.9	1.4 - 2.3	2168	36	1.7	1.1 - 2.2
Div/.Sep./Widow	73	2	2.7	0.0 - 6.5	205	3	1.5	0.0 - 3.1

HBV was significantly higher in married.

Over all injection practices in the country

Previous studies have shown that Pakistan has the highest injection rates for therapeutic injections and the number varies from 13 to 14 injections per person per year. According to WHO about 3.6 injections per person per year are acceptable. In the present study the intramuscular injection (IM) use was arbitrarily divided in 3 groups i.e. those taking less than 5 injections per year, those taking between 5-10 injections per year and those taking more than 10 injections per year.

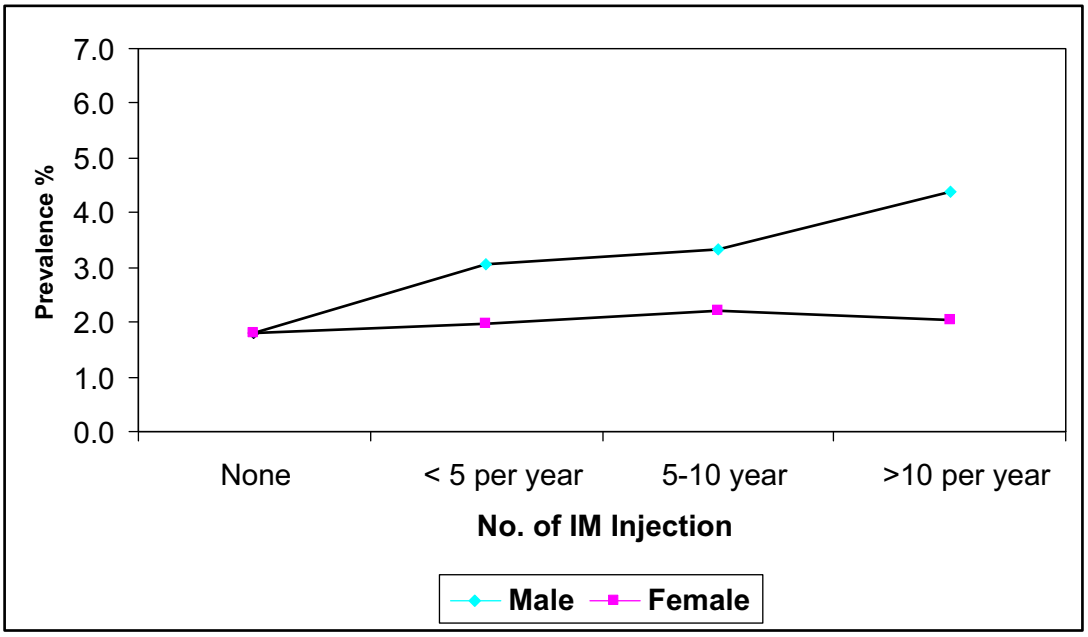
The therapeutic injection use in HBV cases showed that about 2% was using almost negligible injections, while about 2.5% population was taking injections within WHO limits. About 6% population was taking more than 5 injections per person per year **(Table 9).**

Table 9: Prevalence of HBsAg according to use of IM injection

No. of IM Injection per year	Overall			Male			Female		
	No. of Subjects	HBsAg		No. of Subjects	HBsAg		No. of Subjects	HBsAg	
		No.	%		No.	%		No.	%
None	10987	198	1.8	5998	111	1.8	4989	87	1.7
< 5	22623	574	2.5	11714	359	3.1	10909	215	2.0
5 - 10	10492	291	2.8	5318	177	3.3	5174	114	2.2
> 10	2941	93	3.2	1414	62	4.4	1527	31	2.0
Total	47043	1156	2.5	24581	709	2.9	22462	447	1.9

The injection figures when separated for males and females showed less therapeutic injections in females (**Figure-1).**

Figure-1: Prevalence of HBsAg according to use of IM injection in gender



Majority (55.5%) of the individuals in Punjab were taking less than 5 injections per person per year, while Sindh showed the highest injection use of 5-10 injections per person per year seen in 33% population. For the category that was taking more than 10 injections per person per year NWFP topped the list with 10% figures **(Table 10)** as against 5, 6 and 7% in Punjab, Sindh and Balochistan respectively.

Table 10: Number of injections used per year according to Province

Province	No. of Subjects	Number of Injections			
		None	< 5	5 -10	> 10
Punjab	25206	6949 (27.6%)	12479 (49.5%)	4500 (17.9%)	1278 (5.1%)
Sindh	8909	2080 (23.3%)	3357 (37.7%)	2942 (33.0%)	530 (5.9%)
NWFP	7637	1109 (14.5%)	3851 (50.4%)	1911 (25.0%)	766 (10.0%)
Balochistan	5291	849 (16.0%)	2936 (55.5%)	1139 (21.5%)	367 (6.9%)
Total	47043	10987 (23.4%)	22623 (48.1%)	10492 (22.3%)	2941 (6.3%)

Over all about 48% of the population was taking less than 5 injections per year, 22% were taking between 5-10 injections and 6% were taking over 10 injections per person per year **(Table 10).**

If we combine the two latter groups as one (more than 5 injections per year) than about 28% population is at a high risk of contracting the diseases that spread through injections. With a population size of 160 million this 30% would make 48 million populations at risk of contracting blood born infections.

Use of injections was more in females than in males in 3 groups i.e. those taking less than 5 injections per year, those taking between 5-10 injections per year and those taking more than 10 injections per year **(Table 11).**

Table 11: Number of injections used per year according to gender

Gender	No. of Subjects	Number of Injections			
		None	< 5	5 -10	> 10
Male	24444	5998 (24.5%)	11714 (47.9%)	5318 (21.8%)	1414 (5.8%)
Female	22599	4989 (22.1%)	10909 (48.3%)	5174 (22.9%)	1527 (6.8%)
Total	47043	10987 (23.4%)	22623 (48.1%)	10492 (22.3%)	2941 (6.3%)

Prevalence of HBsAg with the type of syringe i.e. new vs reused syringe

Individuals were asked whether they took their own syringe to the general practitioner for injection or the practitioner used his own syringe. The practitioner syringe most of the times was confirmed by the people to be a recycled syringe which was used from a boiler. With the new syringe the HBsAg prevalence was 2%. When reused syringe was used, the prevalence for HBV rose to 3% **(Table-12).**

Table 12: Prevalence of HBsAg according to type of Syringes

Syringes	No. of Subjects	Prevalence of HBsAg		
		No	%	95% Confidence Interval
None	10987	198	1.8	1.6 – 2.1
New disposable	15563	325	2.1	1.9 – 2.3
Re-used syringe	17696	538	3.0	2.8 – 3.3
Don't Know	2797	95	3.4	2.7 – 4.1
Total	**47043**	**1156**	**2.5**	2.3 – 2.6

The possible risk factors for the disease transmission are shown in the **Table 13.** Therapeutic injections, syringe reuse, sharing of razors while getting shave from barbers, surgery, blood transfusion and hospitalization were the main risk factors for disease transmission.

Table 13: Possible risk factors for disease transmission in HBsAg

Risk Factors		No. of Subjects	HBsAg No. (%)	Odd Ratio (95% Confidence Interval)
Use of IM Injection	None	10987	198 (1.8)	Reference
	<5	22623	574 (2.5)	** 1.4 (1.2 - 1.7)
	5 -10	10492	291 (2.8)	** 1.6 (1.2 - 1.9)
	> 10	2941	93 (3.2)	** 1.8 (1.3 - 2.3)
Type of Syringe	None	10987	198 (1.8)	Reference
	New/disposable	15563	325 (2.1)	1.2 (0.9 - 1.4)
	Re-used	17696	538 (3.0)	** 1.7 (1.4 - 2.0)
Shaving	None	5288	180 (3.4)	Reference
(Male adults age 20 years & above)	Home	1983	73 (3.7)	1.1 (0.8 - 1.4)
	Barbar	5419	224 (4.1)	** 1.5 (1.2 - 1.9)
Sharing Tooth Brush / Miswak	No	42364	1083 (2.6)	Reference
(5 years & above age group)	Yes	476	20 (4.2)	* 1.6 (1.0 - 2.7)
Sharing Cigarettes/Hookah/Bidi	No	23027	698 (3.0)	Reference
(Adults 20 years & above age group)	Yes	1373	75 (5.5)	** 1.8 (1.4 - 2.4)
Tattooing / Acupuncture	No	42606	1095 (2.6)	Reference
(5 years & above age group)	Yes	229	8 (3.5)	1.4 (0.6 - 2.8)
Ear / Nose Piercing	No	5257	76 (1.5)	Reference
(Female 5 years & above age group)	Yes	15141	351 (2.3)	** 1.6 (1.2 - 2.1)
History of Hospitalization	No	44757	1095 (2.4)	Reference
	Yes	2286	61 (2.7)	1.1 (0.8 - 1.4)
History of Surgery	No	44697	1083 (2.4)	Reference
	Yes	2346	73 (3.1)	* 1.3 (1.0 – 1.2)

OR = Odd Ratio, C.I. = Confidence Interval, Statistically significant ** $p<0.01$, * $p<0.05$

Prevalence of anti HCV in Population

The prevalence of HCV in the four provinces with 95% confidence interval is shown in Table 14. The HCV prevalence was highest in Punjab (6.7%) followed by Sindh (5.0%). The over all prevalence of HCV in the population was 4.9%.

Table 14: Prevalence of HCV in all Provinces

Province	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
Sindh	8909	448	**5.0**	4.6 – 5.5
Punjab	25206	1683	**6.7**	6.4 – 7.0
NWFP	7637	84	**1.1**	0.9 – 1.3
Balochistan	5291	79	**1.5**	1.2 – 1.8
Total	47043	2294	**4.9**	4.7 – 5.1

Overall HCV prevalence was 4.9% with no gender difference **(Table 15).**

Table 15: Prevalence of HCV according to gender

Gender	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
Overall	47043	2294	4.9	4.7 – 5.1
Male	24444	1204	4.9	4.7 – 5.2
Female	22599	1090	4.8	4.5 – 5.1

Prevalence of anti HCV in different age group

A total of 47043 individuals were screened and of these only 48% (22585) were children (less than 20 years) and rest 52% were adults. The marker prevalence in different age groups is shown in **Table 16**.

Table 16: Prevalence of HCV according to age

Age in years	No. of Subjects	Prevalence of HCV		
		No	%	95% Confidence Interval
Under 5 years	4188	79	1.9	1.5 – 2.3
5-19	18397	379	2.1	1.9 – 2.3
20-29	8580	375	4.4	3.9 – 4.8
30-39	5770	451	7.8	7.1 – 8.5
40-49	4453	443	9.9	9.1 – 10.8
50-59	2800	290	10.4	9.2 – 11.5
60 & above	2777	277	10.0	8.9 – 11.1
Don't know	78	-	-	-
Total	47043	2294	4.8	4.7 – 5.1

For hepatitis C an upward trend was seen from 20 years onwards. With the advancing age the prevalence increased indicating the aggregate of positive cases along with the higher chances of exposure to the virus through injections for common ailments, dental treatments, communal shaving and more frequent visits to health care facilities. The HCV took quick leaps with each advancing decade and reached a peak of 10.4% at 50-59 years age.

Prevalence of anti HCV according to age and gender

The viral prevalence in males and females in various age groups is shown in **Table 17.** The overall trend of more diction of HCV in males then females is due to easy health access. This trend is prevalent through out the country.

Table 17: Prevalence of HCV according to age and gender

Age in years	Male				Female			
	No. of Subjects	Prevalence of HCV			No. of Subjects	Prevalence of HCV		
		No	%	95% Confidence Interval.		No	%	95% Confidence Interval
Under 5 years	2121	35	1.7	1.1 – 2.2	2067	44	2.1	1.5 – 2.8
5-19	9645	192	2.0	1.7 – 2.3	8752	187	2.1	1.8 – 2.4
20-29	4337	170	3.9	3.3 – 4.5	4243	205	4.8	4.2 – 5.5
30-39	2838	204	7.2	6.2 – 8.1	2932	247	8.4	7.4 – 9.4
40-49	2319	261	11.3	10.0 – 12.5	2134	182	8.5	7.3 – 9.7
50-59	1486	162	10.9	9.3 – 12.5	1314	128	9.7	8.1 – 11.3
60 & above	1647	180	10.9	9.4 – 12.4	1130	97	8.6	7.0 – 10.2
Don't know	51	-	-	-	27	-	-	-
Total	24444	1204	4.9	4.7 – 5.2	22599	1090	4.8	4.5 – 5.1

Prevalence of anti HCV according to marital status

Relation of marital status to the exposure to these viruses showed a significantly higher ($p<0.01$) exposure in the married group than in the never married group **(Table 18)**.

Table 18: Prevalence of HCV according to marital status

Marital Status	No. of Subjects	Prevalence of HCV		
		No	%	95% Confidence Interval
Never Married	28015	674	2.4	2.2 – 2.6
Married	17975	1528	8.5	8.1 – 8.9
Div. /Sep. / Widow	1053	92	8.7	7.0 – 10.4
Total	47043	2294	4.9	4.7 – 5.1

An almost 4 times higher prevalence of HCV was seen in married group when compared with the never married group. Married males showed a higher prevalence of HCV then the married females (**Table 19**).

Table 19: Prevalence of HCV according to marital status in both gender

Marital status	Male				Female			
	No. of Subjects	Prevalence of HCV			No. of Subjects	Prevalence of HCV		
		No	%	95% Confidence Interval		No	%	95% Confidence Interval
Never Married	15329	367	2.4	2.2 – 2.6	12686	307	2.4	2.2 – 2.7
Married	8799	809	9.2	8.6 – 9.8	9176	719	7.8	7.3 – 8.4
Div. /Sep. / Widow	316	28	8.9	5.7 – 12.0	737	64	8.7	6.7 – 10.7
Total	24444	1204	4.9	4.7 – 5.2	22599	1090	4.8	4.5 – 5.1

After the exclusion of less than 20 years age group from the married group, the difference in married and unmarried still persisted **(Table 20).**

Table 20: Prevalence of HCV according to marital status in 20-49 years of age in male and female

Marital status	Males				Females			
	No. of Subjects	HCV			No. of Subjects	HCV		
		No	%	95% Confidence Interval		No	%	95% Confidence Interval
Married	5813	403	8.4	6.3 – 7.6	6934	532	7.7	7.0 – 8.3
Never Married	3607	139	3.9	3.2 – 4.5	2168	80	3.7	2.9 – 4.5
Div/.Sep./Widow	139	5	6.8	0.5 – 7.6	205	20	9.8	5.7 – 13.8

HCV figures were significantly higher in the married group.

Over all injections practices in the country

Pakistan has the highest rates for therapeutic injections, which vary from 13-14 injections per person per year. According to WHO an individual can have 3.6 injections per person per year. In the present study the injection use was arbitrarily divided in 3 groups i.e. those taking less than 5 injections per year, those taking between 5-10 injections per year and those taking more than 10 injections per year.

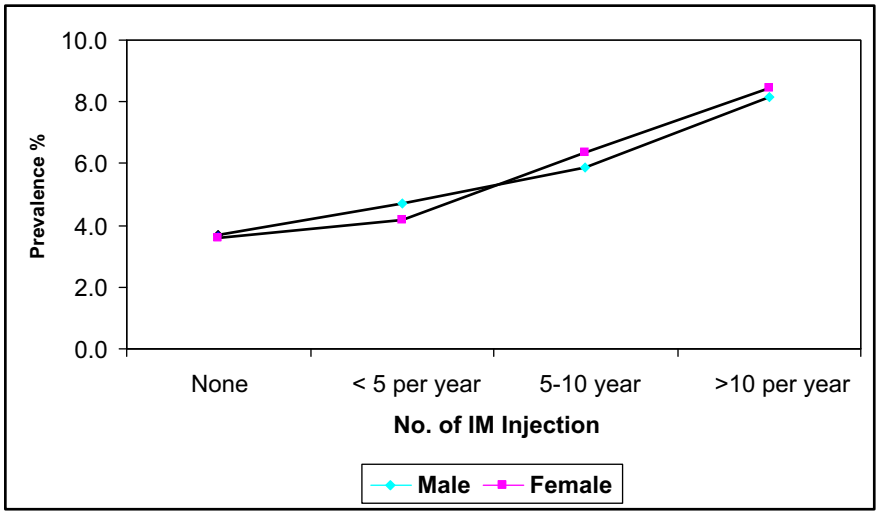
About 4.5% of the population was taking less than 5 injections per person per year and 6.1% were taking between 5-10 and 8.3% more than 10 injections per year (**Table 21**). This high injection using population is at a high risk of contracting blood born diseases. The HCV prevalence increased significantly (P<0.01) with the increase in the number of injections and reached twice the baseline figures when over 10 injections were taken per person per year.

Table 21: Prevalence of HCV according to IM injections per year

No. of Injection per year	Overall			Male			Female		
	No. of Subjects	Prev. HCV		No. of Subjects	Prev. HCV		No. of Subjects	Prev. HCV	
		No.	(%)		No.	(%)		No.	(%)
None	10987	402	3.7	5998	227	3.8	4989	175	3.5
< 5	22623	1007	4.5	11714	550	4.7	10909	457	4.2
5 – 10	10492	641	6.1	5318	312	5.9	5174	329	6.4
> 10	2941	244	8.3	1414	115	8.1	1527	129	8.4
Total	47043	2294	4.9	24444	1204	4.9	22599	1090	4.9

The injection figures when separated for males and females did not show much difference **(Figure-2).**

Figure-2: Prevalence of HCV according to use of IM injections in both gender



Over all injection figures irrespective of HBV or HCV infection showed that about 29% population was taking more than 5 injections **(Table 22).**

Table 22: Overall injection use in each Province

Province	No. of Subjects	Number of Injections			
		None	< 5	5 -10	> 10
Punjab	25206	6949 (27.6%)	12479 (49.5%)	4500 (17.9%)	1278 (5.1%)
Sindh	8909	2080 (23.3%)	3357 (37.7%)	2942 (33.0%)	530 (5.9%)
NWFP	7637	1109 (14.5%)	3851 (50.4%)	1911 (25.0%)	766 (10.0%)
Balochistan	5291	849 (16.0%)	2936 (55.5%)	1139 (21.5%)	367 (6.9%)
Total	47043	10987 (23.4%)	22623 (48.1%)	10492 (22.3%)	2941 (6.3%)

Prevalence of anti HCV with the type of syringe i.e. new vs reused syringe

Individuals were also asked whether they took their own syringe to the general practitioner for injection or the practitioner used his own syringe. The practitioner syringe most of the times was confirmed by the people to be a recycled syringe which was used from a boiler. With the new syringe the HCV prevalence was 3.5%, which rose to 2 folds i.e., 6.8% when a reused syringe was used ($p<0.01$) **(Table 23).** About 4% people did not know which syringe was used. As these individuals did not take their own syringe so it can be presumed that the "don't know" group was also being injected with a reused syringe, and then these figures will further go up **(Table 23**).

Table 23: Prevalence of HCV according to use of syringes

Syringes	No. of Subjects	Prevalence of HCV		
		No	%	95% Confidence Interval
None	10987	402	3.7	3.3 – 4.0
New disposable	15563	552	3.5	3.3 – 3.8
Re-used syringe	17696	1198	6.8	6.4 – 7.1
Don't Know	2797	142	5.1	4.3 – 5.9
Total	47043	2294	4.9	4.7 – 5.1

Use of injections was more in males than in females but the HCV prevalence trend with the reuse of syringe were similar in both gender (**Table 24**).

Table 24: Prevalence of HCV according to type of syringes in both gender

Syringes	Male				Female			
	No. of Subjects	HCV			No. of Subjects	HCV		
		No.	(%)	95% Confidence Interval		No.	(%)	95% Confidence Interval
None	5998	227	3.8	3.3 – 4.3	4989	175	3.5	3.0 – 4.0
New disposable	8019	300	3.7	3.3 – 4.2	7544	252	3.3	2.9 – 3.7
Re-used syringe	8995	615	6.8	6.3 – 7.4	8701	583	6.7	6.2 – 7.2
Don't know	1432	62	4.3	3.3 – 5.4	1365	80	5.9	4.6 – 7.1
Total	24444	1204	4.9	4.7 – 5.2	22599	1090	4.8	4.5 – 5.1

Possible risk factors for disease transmission

Various risk factors for hepatitis transmission were questioned in the population to see their behavior and correlate these risk factors with disease (**Table 25**).

Injections for various ailments showed a positive correlation with the disease prevalence. Similarly the higher were the number of injections, the higher was the disease.

History of hospitalization was present in 9.8% cases and history of surgery was present in 10% cases who were HCV positive. Lack of injection safety which includes reuse of syringes, improper sterilization of invasive medical devices and poor disposal of hospital waste are probably contributing to high HCV exposure in the hospitalized population.

Table 25: Possible risk factors for disease transmission in HCV

Risk Factors		No. of Subjects	HCV No. (%)	OR (95% Confidence Interval)
Use of IM Injection	None	10987	402 (3.7)	Reference
	<5	22623	1007 (4.5)	** 1.2 (1.1 - 1.4)
	5 -10	10492	641 (6.1)	** 1.7 (1.5 - 1.9)
	> 10	2941	244 (8.3)	** 2.4 (2.0 - 2.8)
Type of Syringe	None	10987	402 (3.7)	Reference
	New/disposable	15563	552 (3.5)	0.9 (0.8 - 1.1)
	Re-used	17696	1198 (6.8)	** 1.9 (1.7 - 2.2)
Shaving (Male adults age 20 years & above)	None	5288	295 (5.6)	Reference
	Home	1983	149 (7.5)	** 1.4 (1.1 - 1.7)
	Barbar	5419	532 (9.8)	** 1.8 (1.5 - 2.1)
Sharing Tooth Brush / Miswak (5 years & above age group)	No	42364	2173 (5.1)	Reference
	Yes	476	41 (8.4)	** 1.6 (1.2 - 2.4)
Sharing Cigarettes/Hookah/Bidi (Adults 20 years & above age group)	No	23027	1676 (7.3)	Reference
	Yes	1373	158 (11.5)	** 1.7 (1.4 - 2.0)
Tattooing / Acupuncture (5 years & above age group)	No	42606	2195 (5.2)	Reference
	Yes	229	19 (8.3)	** 1.6 (1.0 - 2.7)
Ear / Nose Piercing (Female 5 years & above age group)	No	5257	161 (3.1)	Reference
	Yes	15141	886 (5.8)	** 2.0 (1.7 - 2.4)
History of Hospitalization	No	44757	2071 (4.6)	Reference
	Yes	2286	223 (9.8)	1.2 (1.0 - 1.4)
History of Surgery	No	44697	2058 (4.6)	Reference
	Yes	2346	236 (10.1)	** 2.3 (2.0 - 2.7)

OR = Odd Ratio, C.I. = Confidence Interval, Statistically significant ** $p<0.01$, * $p<0.05$

Province wise Disease Distribution

The distribution of HBsAg and HCV in different provinces is shown together in Table 26 to get an easier view of the disease.

The HBsAg prevalence figures were similar in Sindh and Punjab, individual values being 2.5% and 2.4% respectively. For NWFP the figures were low i.e., 1.3% but very high figures (4.3%) were seen in Balochistan.

For HCV figures were highest in Punjab where 6.7% population had positive HCV, while in Sindh 5% were positive. Low figures for HCV were seen in NWFP (1.1%) and Balochistan (1.5%).

Table 26: Prevalence of HBsAg and HCV in all Provinces

Province	No. of Subjects	Prevalence of HBsAg			Prevalence of HCV		
		No.	%	95% Confidence Interval	No.	%	95% Confidence Interval
Sindh	8909	227	**2.5**	2.2 – 2.9	448	**5.0**	4.6 – 5.5
Punjab	25206	606	**2.4**	2.2 – 2.6	1683	**6.7**	6.4 – 7.0
NWFP	7637	97	**1.3**	1.0 – 1.5	84	**1.1**	0.9 – 1.3
Balochistan	5291	226	**4.3**	3.7 – 4.8	79	**1.5**	1.2 – 1.8
Total	47043	1156	**2.5**	2.3 – 2.6	2294	**4.9**	4.7 – 5.1

Prevalence of HBsAg and anti HCV in Sindh

A total of 8909 subjects were screened in Sindh. There were 4956 males and 4313 females.

Distribution of HBsAg in both gender

Of the total HBsAg was found positive in 3.4% males and 1.7% females (**Table 27**). The high prevalence of HBsAg in males is due to two reasons, one being the well documented affinity of the virus for male gender and the other is the pockets of high prevalence of HBV in Sindh which has been reported previously in many studies.

Table 27: Prevalence of HBsAg according to gender in Sindh

Gender	No. of Subjects	HBsAg		
		No	%	95% Confidence Interval
Male	4596	154	3.4	2.9 – 3.9
Female	4313	73	1.7	1.3 – 2.1
Total	8909	227	2.5	2.2 – 2.8

Prevalence of HBsAg in different ages

The distribution of HBsAg positive cases according to age is shown in **Table 28**. Of 8909 subjects screened, 876 were less than 5 years of age and another 3390 were between 5-19 years of age. The HBsAg prevalence in less than 5 years age group was 1.1% and this figure rose to 2.1% in the 5-19 years age group, making 3.3% children positive for HBsAg. The HBsAg prevalence figures gradually rose to 2.6% in the 2nd decade, 3.1% in the 3rd decade, than showed a dip of 2.3% in the 4th decade with a sudden rise of 5.3% in the 5th decade and finally dropped to 3.9% in the 6th decade **(Table 28)**.

Higher HBV figures in the elderly probably reflects the population, which has not been vaccinated, as the HBV vaccine was introduced in EPI in the year 2000. A drop at 60 years is probably due to a drop in the population as the average life expectancy is around 57 years; other probability is natural seroconversion that starts anytime after 40 years at a rate of 5-10% per year depending upon the genotypes of the hepatitis virus and the individual genes.

Table 28: Prevalence of HBsAg according to age in Sindh

Age group	No. of Subjects	HBsAg		
		No	%	95% Confidence Interval
Under 5 years	876	10	1.1	0.4 – 1.8
5-19	3390	70	2.1	1.6 – 2.6
20-29	1498	39	2.6	1.8 – 3.4
30-39	1124	35	3.1	2.1 – 4.1
40-49	861	20	2.3	1.3 – 3.3
50-59	604	32	5.3	3.5 – 7.1
60 & above	533	21	3.9	2.3 – 5.5
Don't know	23	-	-	-
Total	8909	227	2.5	2.2 – 2.8

Correlation of viral markers to marital status is shown in **Table 29.** Never married cases which also include children showed 2% figures for HBV, but these figures rose to 3.3% in the married group probably showing some exposure to the virus in the reproductive age.

A drop in HBV figures in the divorced, widow group is either due to a small number of cases in this group or due to a more advanced age in this group or lesser exposure to the sources of infection.

Table 29: Prevalence of HBsAg according to marital status in Sindh

Marital status	No. of Subjects	HBsAg		
		No	%	95% Confidence Interval
Never Married	5203	107	2.1	1.7 – 2.5
Married	3531	116	3.3	2.7 – 3.9
Div. / Sep. / Widow	175	4	2.3	0.1 – 4.5
Total	8909	227	2.5	2.2 – 2.8

Injection practices for common ailments were also looked into to see the trend of injections and the concept of disease transmission by using a used syringe. Frequency of injections were divided into those taking less than 5 injections/year, 5-10 injections /year and more than 10 injections /year **(Table 30).** The number of injections per person/year did not show much difference till 5-10 injections per person/year after which the figures rose from 2.5% to 4%.

Table 30: Prevalence of HBsAg according to number of injections in Sindh

IM Injection	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	2080	33	1.6	1.0 - 2.1
< 5	3357	97	2.9	2.3 - 3.5
5-10	2942	76	2.6	2.0 - 3.2
> 10	530	21	4.0	2.3 - 5.6
Total	8909	227	2.5	2.2 - 2.9

The trend to get injections with a reused syringe was compared with the use of a new syringe: Persons were inquired about taking a syringe with the patient for injection or checking that a new syringe was being used vs a syringe used from the practitioners clinic (reused). Only 37 individuals could not answer whether the practitioner used a new syringe or not **(Table 31).** HBV prevalence showed a rising trend when used syringes were used.

Table 31: Prevalence of HBsAg according to type of syringe in Sindh

Syringe type	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	2080	33	1.6	1.0 - 2.1
New / Disposable	2686	56	2.1	1.5 - 2.6
Re-used	3982	134	3.4	2.8 - 4.9
Don't Know	161	4	2.5	0.1 - 4.9
Total	8909	227	2.5	2.2 - 2.9

Prevalence anti HCV in Sindh

A total of 8909 subjects were screened in Sindh. There were 4956 males and 4313 females.

Distribution of HCV in both gender: The HCV prevalence figures were similar in both gender i.e. 5.1% males and 5% females **(Table 32).** Equal affection of both gender indicates common sources of exposure in this population.

Table 32: Prevalence of HCV according to gender in Sindh

Gender	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Male	4596	234	5.1	4.5 – 5.7
Female	4313	214	5.0	4.3 – 5.7
Total	8909	448	5.0	4.5 – 5.5

The anti HCV prevalence according to age: The distribution of HCV positive cases according to age is shown in **(Table 33)**.

Table 33: Prevalence of HCV according to age in Sindh

Age group	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Under 5 years	876	8	0.9	0.3 – 1.5
5-19	3390	53	1.6	1.2 – 2.0
20-29	1498	80	5.3	4.2 – 6.4
30-39	1124	102	9.1	7.4 – 10.8
40-49	861	90	10.5	8.5 – 12.5
50-59	604	76	12.6	10.0 – 15.2
60 & above	533	39	7.3	5.1 – 9.5
Don't know	23	-	-	-
Total	8909	448	5.0	4.5 – 5.5

The HCV exposure was seen as early as in less than 5 years of age in 0.9% children which rose to 1.6% in 5-19 years, making an aggregate of 2.5% children who have been exposed to this virus. The HCV prevalence in less than 2 years of age group is often seen as a maternal transmission and these children often clear the antibodies after 2 years. The HCV figures suddenly leap to 5.3% in the 2nd decade, 9.1% in the 3rd decade 10.5% in the 4th, 12.6% in the 5th decade. A drop in figures is seen at 6th decade where these figures go to 7.3%.

The higher exposure to this virus starting from 2nd decade onwards is possibly due to higher use of injections and intravenous (I.V) drips for common ailments, use of unscreened blood and more visits to health care providers (public and private both) for

illnesses. Men go out for shaving at communal barbers or barbers pay home visits using the same equipment from one person to other. This trend of injections, I.V drips and blood transfusions has erupted as a result of belief in the population that injections cure faster and better than the oral medications and secondly the practitioner makes substantial money by giving parenteral therapy.

Correlation of viral markers to marital status is shown in **(Table 34)**. Never married cases which also included children showed 2% figures for HCV prevalence, but these figures rose to 9.4 % in the married group. The reasons for high figures in married group could be attributed to frequent visits to health care providers for issues related to births, anemia, nutritional deficiencies, workload etc. A drop in figures in the divorced, widow group is either due to a small number of cases in this group or due to more advanced age in this group or lesser exposure to the sources of infection.

Table 34: Prevalence of HCV according to marital status in Sindh

Marital status	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Never Married	5203	104	2.0	1.6 – 2.4
Married	3531	332	9.4	8.4 – 10.4
Div. / Sep. / Widow	175	12	6.9	3.1 – 10.7
Total	8909	448	5.0	4.5 – 5.5

Injection practices for common ailments were also looked into to see the trend of injections and the concept of disease transmission by using a used syringe. Frequency of injections were divided into taking less than 5 injections/year, 5-10 injections /year and more than 10 injections /year. There was a positive correlation of HCV with the number of injections; and it was seen that with the increasing number of injections per person per year the frequency of HCV prevalence also raised manifold **(Table 35).**

Table 35: Prevalence of HCV according to use of IM injection in Sindh

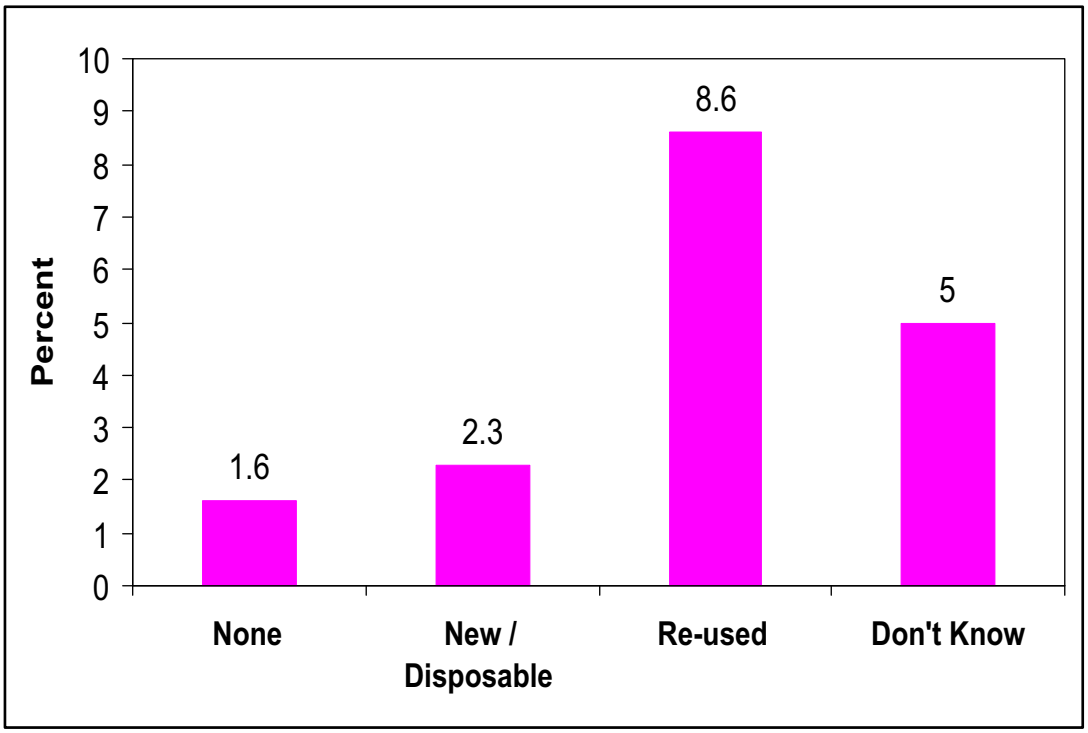
IM Injection	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	2080	34	1.6	1.1 - 2.2
< 5	3357	159	4.7	4.0 - 5.5
5-10	2942	189	6.4	5.5 - 7.3
> 10	530	66	12.5	9.6 - 15.3
Total	8909	448	5.0	4.6 - 5.5

The trend to get injections with a reused syringe was compared with the use of a new syringe: Persons were inquired about taking a syringe with the patient for injection or checking that a new syringe was being used vs a syringe used from the practitioners clinic (reused). Only 8 individuals could not answer whether the practitioner used a new syringe or not. HCV prevalence showed a significantly rising trend when used syringes were reused where the figures jumped from 2.3% in the group where new syringe was used, to 8.6% when syringes were being reused **(Table 36 & figure 3).**

Table 36: Prevalence of HCV according to type of syringes in Sindh

Syringe Type	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	2080	34	1.6	0.1 - 2.2
New / Disposable	2686	63	2.3	1.7 - 2.9
Re-used	3982	343	8.6	7.7 - 9.5
Don't Know	161	8	5.0	1.6 - 8.3
Total	8909	448	5.0	4.5 - 5.5

Figure 3: Prevalence of HCV according to type of syringes in Sindh



Prevalence of HBsAg in Punjab

A total of 25206 subjects were screened in Punjab. There were 13352 males and 11854 females.

Distribution of HBsAg in both gender

Of the total HBsAg was found positive in 2.7% males and 2.1% females (**Table 37**).

Table 37: Prevalence of HBsAg according to gender in Punjab

Gender	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Male	13352	358	2.7	2.4 – 3.0
Female	11854	248	2.1	1.8 – 2.4
Total	25206	606	2.4	2.2 – 2.6

Prevalence of HBsAg according to ages

The distribution of HBsAg positive cases according to age is shown in **Table 38.** Of the total 25206 subjects screened, 2055 were less than 5 years of age and 9839 were between 5-19 years of age. The HBsAg prevalence in less than 5 years age group was 1.5% and this figure rose to 1.7% in the 5-19 years of age group, making 3.2% children positive for HBsAg. The HBsAg prevalence figures gradually rose to 2.0% in the 2nd decade, 3.2% in the 3rd decade, 4.2% in 4th decade then showed a dip of 3.8% in the 5th decade and finally increased 4.1% in the 6th decade (**Table-38**). Higher HBV figures in the elderly probably reflects the population, which has not been vaccinated, as the HBV vaccine was introduced in EPI in the year 2000.

Table 38: Prevalence of HBsAg according to age in Punjab

Age group	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Under 5 years	2055	30	1.5	1.0 – 2.0
5-19	9839	165	1.7	1.4 – 2.0
20-29	4825	96	2.0	1.6 – 2.4
30-39	3104	98	3.2	2.6 – 3.8
40-49	2385	100	4.2	3.4 – 5.0
50-59	1411	53	3.8	2.8 – 4.8
60 & above	1564	64	4.1	3.1 – 5.1
Don't know	23	-	-	-
Total	25206	606	2.4	2.2 – 2.6

Correlation of viral markers to marital status

Correlation of viral markers to marital status is shown in **(Table 39)**. Never married cases which also include children showed 1.6% figures for HBV, but these figures rose to 3.6% in the married group probably showing some exposure to the virus in the reproductive age. A drop in HBV figures in the divorced, widow group is either due to a small number of cases in this group or due to a more advanced age in this group or lesser exposure to the sources of infection.

Table 39: Prevalence of HBsAg according to marital status in Punjab

Marital status	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Never Married	15176	247	1.6	1.4 – 1.8
Married	9323	335	3.6	3.2 – 4.0
Divorced/Seprated/ Widow	707	24	3.4	2.1 – 4.7
Total	25206	606	2.4	2.2 – 2.6

Injection practices for common ailments

Injection practices for common ailments were also looked into to see the trend of injections and the concept of disease transmission by using a used syringe. Frequency of injection was divided into those taking less than 5 injection/year, 5-10 injections/year and more than 10 injections/year **(Table 40)**. The number of injections per person did not show much difference in till those taking less than 5 injections and more than 10 injections.

Table 40: Prevalence of HBsAg according to use of IM injections in Punjab

IM Injection	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	6949	145	2.1	1.8 - 2.4
< 5	12479	309	2.5	2.2 - 2.7
5-10	4500	119	2.6	2.2 -3.1
> 10	1278	33	2.6	1.7 - 3.5
Total	25206	606	2.4	2.2 - 2.6

Prevalence of anti HCV in Punjab

Punjab is the most populous province of Pakistan. In Punjab a total of 25206 subjects were screened for anti HCV. There were 13352 males and 11854 females. Overall HCV prevalence was 6.7%.

Distribution of HCV in both gender showed 6.7% HCV in males and 6.7% in females **(Table 41**), which is very alarming**.** It shows that in a male dominated society men are likely to get more exposed because of gender preference to treat the males, easy access to health care providers and shaving at community barbers. Equal exposure in women with a much limited access to health care and gender preference in treatment shows that either this group is being exposed during obstetrical care by improperly sterilized devices or is getting unscreened blood transfusion or is being treated by unregistered health care providers.

Table 41: Prevalence of HCV according to gender in Punjab

Gender	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Male	13352	892	6.7	6.3 – 7.1
Female	11854	791	6.7	6.2 – 7.2
Total	25206	1683	6.7	6.4 – 7.0

The anti HCV prevalence according to age is shown in **(Table 42).** The HCV prevalence was 3.4% in those aged less than 5 years of age. This figure is worrying because it shows either maternal transmission from very active PCR positive mothers to their newborn children or shows extremely poor sterilization practices. This trend continued till 19 years of age showing a very early exposure despite limited access to health care and behavior patterns (children run away from injections and pricks). After 19 years of age the HCV figures rose to 5.5% at 2nd decade and doubled to 10.1% at 3rd decade and further went up to 13.7% where they persisted till 6th decade of life.

Table 42: Prevalence of HCV according to age in Punjab

Age group	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Under 5 years	2055	69	3.4	2.6 – 4.2
5-19	9839	300	3.0	2.7 – 3.3
20-29	4825	264	5.5	4.9 – 6.1
30-39	3104	314	10.1	9.0 – 11.2
40-49	2385	327	13.7	12.3 – 15.1
50-59	1411	194	13.7	11.9 – 15.5
60 & above	1564	215	13.7	12.0 – 15.4
Don't know	23	-	-	-
Total	25206	1683	6.7	6.4 – 7.0

Correlation of viral markers to marital status is shown in **(Table 43)**. The HCV figures for never married group were 3.5%, which are similar to the under 5 year's age figures. The prevalence figures for HCV rose to 3 times i.e. 11.6% in the married group again showing high exposure to HCV in these persons due to lack of awareness and poor health facilities.

Table 43: Prevalence of HCV according to marital status in Punjab

Marital status	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Never Married	15176	525	3.5	3.2 – 3.8
Married	9323	1083	11.6	10.9 – 12.3
div. / Sep./ Widow	707	75	10.6	8.3 – 12.9
Total	25206	1683	6.7	6.4 – 7.0

Injection use was evaluated to see the correlation of injection use with the viral prevalence **(Table 44)**. Numbers of injections were divided into less than 5 per year, 5-10 per years and more than 10 per year. HCV showed an increasing trend with increase in the number of injections and increased manifold when injection use exceeded to more than 10 injections per person per year**.**

Table 44: Prevalence of HCV according to number of IM injections in Punjab

IM Injection	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	6949	365	5.3	4.7 - 5.8
< 5	12479	774	6.2	5.8 - 6.6
5-10	4500	389	8.6	7.8 - 9.5
> 10	1278	155	12.1	10.3 - 13.9
Total	25206	1683	6.7	6.4 - 7.0

The trend to get injections with a reused syringe was compared with the use of a new syringe. This association was seen to correlate the disease with syringe use. As expected majority of cases were still being injected medicines for common ailments using an already used plastic syringe. If we combine the numbers of individuals who did not know what type of a syringe was being used by their practitioner or health care providers as being given injections by a re used syringe then a significant number of cases had a syringe reused **(Table 45)**.

Table 45: Prevalence of HCV according to type of syringes in Punjab

Syringe Type	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	6949	365	5.3	4.7 - 5.8
New / Disposable	8446	463	5.5	5.0 - 6.0
Re-used	7946	741	9.3	8.7 - 9.9
Don't Know	1865	114	6.1	5.0 - 7.2
Total	25206	1683	6.7	6.4 - 7.0

HCV showed very significant rise from 5.5% in those who were getting injections by a new syringe to 9.3% in those getting injections by a reused syringe**.**

Prevalence of HBsAg in North West Frontier Province (NWFP)

In NWFP a total of 7637 individuals were screened for HBsAg and anti HCV. There were 3857 males and 3780 females, showing a higher female population in this province. Overall 1.3% cases tested positive for HBV**.** These figures were very low from the figures seen in Punjab and Sindh. One needs to look into the reasons for these low figures in this population.

Distribution of HBsAg in both gender: In males the prevalence for HBV was 1.6% and in females it was 1% **(Table 46)**.

Table 46: Prevalence of HBsAg according to gender in NWFP

Gender	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Male	3857	61	1.6	1.2 – 2.0
Female	3780	36	1.0	0.7 – 1.3
Total	7637	97	1.3	1.0 – 1.6

The cultural trends in NWFP prohibit the adult males to shave their beard therefore majority of subjects keep a beard from the very adulthood. Those who shave usually stop shaving later in life. Another culture is to do head shave very often either at home or at community barbers. There is yet another very peculiar culture specific to this province and that was the use of a communal miswak (a stem from a neem tree whose end is split into fibers to act as a tooth brush). All the men coming to perform wado before praying in the mosque use these miswaks and leave them behind for others to use.

The HBsAg prevalence according to age is shown in **(Table 47).** Only 1 child was positive for HBV in less than 5 years age group. The figures showed a very slow upward trend with the increase in age and reached a maximum of 3.3% figures for HBV and 3% for HCV in the 60 years age group.

Table 47: Prevalence of HBsAg according to age in NWFP

Age group	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Under 5 years	672	1	0.1	0.0 – 0.3
5-19	3017	34	1.1	0.7 – 1.5
20-29	1387	13	0.9	0.4 – 1.4
30-39	881	9	1.0	0.3 – 1.7
40-49	720	13	1.8	0.8 – 2.8
50-59	511	13	2.5	1.1 – 3.9
60 & above	428	14	3.3	1.6 – 5.0
Don't know	21	-	-	-
Total	7637	97	1.3	1.0 – 1.6

Correlation of viral markers to marital status is shown in **(Table 48)**. The never married group had 0.8% prevalence of HBsAg. The figures rose to 1.9% in the married group again suggesting more exposure to the virus in the married group.

Table 48: Prevalence of HBsAg according to marital status in NWFP

Marital status	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Never Married	4421	37	0.8	0.5 – 1.1
Married	3144	59	1.9	1.4 – 2.4
Div. / Sep. / Widow	72	1	1.4	0.0 – 4.1
Total	7637	97	1.3	1.0 – 1.6

Injection use for common ailments. The injection use per person per year was divided into 3 groups i.e. those taking less than 5 injections per year, those taking between 5-10 injections per year and those taking more than 10 injections per year. As with other provinces the higher was the injections use the higher were the figures for HCV prevalence but these figures showed a rapid rise by almost eight times **(Table 49).**

Table 49: Prevalence of HBsAg according to number of IM injections in NWFP

IM Injection	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	1109	3	0.3	0.0 - 0.6
Less then 5	3851	46	1.2	0.9 - 1.5
5-10	1911	28	1.5	0.9 - 2.0
> 10	766	20	2.6	1.5 - 3.7
Total	7637	97	1.3	1.0 - 1.5

Use of a new disposable syringe vs a reused by the general practitioner was inquired to see the relation of reused syringes with the virus prevalence. A slightly higher trend in HBV prevalence was seen when syringe was being reused **(Table 50)**, but these figures were much lower than those seen in other provinces like Punjab and Sindh**.**

Table 50: Prevalence of HBsAg according to type of syringes in NWFP

Syringe Type	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	1109	3	0.3	0.0 - 0.6
New / Disposable	2749	27	1.0	0.6 - 1.4
Re-used	3638	62	1.7	1.2 - 2.1
Don't Know	141	5	3.5	0.4 - 0.6
Total	7637	97	1.3	1.0 - 1.5

Prevalence of anti HCV in NWFP

In NWFP, a total of 7637 subjects were screened for HCV markers. There were 3857 males and 3780 females. Overall HCV prevalence was 1.1%.

Prevalence of anti HCV in both gender in NWFP

Both males and females were equally affected and there was no gender discrimination in HCV positive cases **(Table 51).**

Table 51: Prevalence of HCV according to gender in NWFP

Gender	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Male	3857	42	1.1	0.8 – 1.4
Female	3780	42	1.1	0.8 – 1.4
Total	7637	84	1.1	0.9 – 1.3

Prevalence of anti HCV according to age is shown in **(Table 52).** None of the child was positive for HCV in the than 5 years age group. The figures showed a very slow upward trend with the increase in age and reached a maximum of 3% in the 60 years age group.

Table 52: Prevalence of HCV according to age in NWFP

Age group	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Under 5 years	672	-	-	-
5-19	3017	11	0.4	0.2 – 0.6
20-29	1387	18	1.3	0.7 – 1.9
30-39	881	19	2.2	1.2 – 3.2
40-49	720	12	1.7	0.8 – 2.6
50-59	511	11	2.2	0.9 – 3.5
60 & above	428	13	3.0	1.4 – 4.6
Don't know	21	-	-	-
Total	7637	84	1.1	0.9 – 1.3

Correlation of viral markers to marital status is shown in **(Table 53)**. The never married group had 0.5% HCV exposure rates and these figures rose to 2% in the married group.

Table 53: Prevalence of HCV according to marital status in NWFP

Marital status	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Never Married	4421	20	0.5	0.3 – 0.7
Married	3144	63	2.0	1.5 – 2.5
Div. / Sep. / Widow	72	1	1.4	0.0 – 4.1
Total	7637	84	1.1	0.9 – 1.3

Injection use for common ailments. The injection use per person per year was divided into 3 groups i.e. those taking less than 5 injections per year, those taking between 5-10 injections per year and those taking more than 10 injections per year. As the number of injections increased the HCV prevalence did not increase, which is very much in contrast to the previous provinces where a positive correlation was seen with the rise in injection use **(Table 54).**

Table 54: Prevalence of HCV according to number of injections per year in NWFP

IM Injection	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	1109	2	0.2	0.0 - 0.4
< 5	3851	41	1.1	0.7 - 1.4
5-10	1911	27	1.4	0.8 - 1.9
> 10	766	14	1.8	0.8 - 2.8
Total	7637	84	1.1	0.8 - 1.3

Use of a new disposable syringe vs a reused by the general practitioner was inquired to see the relation of reused syringes with the virus prevalence. A 4 times higher trend in HCV prevalence was seen when syringe was being reused **(Table 55).**

Table 55: Prevalence HCV according to type of syringes in NWFP

Syringe Type	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	1109	2	0.2	0.0 - 0.4
New / Disposable	2749	11	0.4	0.1 - 0.6
Re-used	3638	68	1.9	1.4 - 2.3
Don't Know	141	3	2.1	0.0 - 4.5
Total	7637	84	1.1	0.8 - 1.3

Prevalence of HBsAg in Balochistan

Balochistan is the largest province of Pakistan but is the least populated with most population concentrating in the major cities. Rural population lives as families whose number varies from few hundred to as low as 20-40 families per area. These clusters of families live miles apart with no proper road, water or sanitation facilities. Health status of the individuals was poor at most sites and when compared between men and women, the latter had worst health and hygiene standards and children were no exception. Being breast fed their health was acceptable but their hygiene was poor.

A total of 5291 cases were screened in Balochistan, of these 2639 were males and 2652 females giving an equal male to female participation. The overall HBsAg prevalence was 4.3% (**Table 56).**

Table 56: Prevalence of HBsAg according to gender in Balochistan

Gender	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Male	2639	136	5.2	4.4 – 6.0
Female	2652	90	3.4	2.7 – 4.1
Total	5291	226	4.3	3.8 – 4.8

Distribution of HBsAg in both gender

The HBV prevalence was 5.2% in males and 3.4% in females, which showed significantly higher figures for HBV in both gender**.** These high figures point towards 2 important issues, one is the male gender preference for hepatitis B virus which is well documented globally and the other is the high virus carrying figures in females showing probably a maternal to child transmission and a perpetuation of the virus in this population. Balochistan like Sindh has been documented in many studies to carry a high HBV rate both as carriers, as disease and as delta positive pocket. Very special HBV vaccination of this population is required along with massive screening in the positive families.

The HBsAg prevalence according to age is shown in **(Table 57).** Almost 2% children were positive of HBsAg below 5 years of age and this percentage jumped to 2.8% in children between 5-19 years age group making an aggregate of 4.9% in children. These high figures are indicating the possibility of vertical transmission as well as horizontal transmission through syringes and instruments used in these children around the time of birth. The HBV figures continue to show a rise with each decade of life and reach a maximum of 7% figure at 4^{th} decade. After 4^{th} decade there is a slow downward trend to 6.6% at 5^{th} decade and 5.2% at 6^{th} decade.

Table 57: Prevalence of HBsAg according to age in Balochistan

Age group	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Under 5 years	585	12	2.1	0.9 – 3.3
5-19	2151	60	2.8	2.1 – 3.5
20-29	870	44	5.1	3.6 – 6.6
30-39	661	45	6.8	4.9 – 8.7
40-49	487	34	7.0	4.7 – 9.3
50-59	274	18	6.6	3.7 – 9.5
60 & above	252	13	5.2	2.5 – 7.9
Don't know	11	-	-	-
Total	5291	226	4.3	3.8 – 4.8

Correlation of viral markers to marital status is shown in **(Table 58)**. The HBsAg prevalence was 2.8% in the never married group and this figure increased to 6.6% in the married group.

Table 58: Prevalence of HBsAg according to marital status in Balochistan

Marital status	No. of Subjects	HBsAg		
		No.	%	95% Confidence Interval
Never Married	3215	90	2.8	2.2 – 3.4
Married	1977	131	6.6	5.5 – 7.7
Divorced/Seprated/ Widow	99	5	5.1	0.8 – 9.4
Total	5291	226	4.3	3.8 – 4.8

Injection use for common ailments

Using parenteral injections mostly as intramuscular injections for common ailments is routine in Balochistan and intravenous injections are used for various other indications like in extreme hot climate to cool the body down and as a remedy for weakness. The figures for HBV were 4.2% for those who were taking less than 5 injections per year. This figure is similar to HBV figures for children less than 19 years of age indicating that these are probably baseline figures. With the rise in injections to 5-10 injections per person per year the HBV prevalence went up to 6% **(Table 59)**. This rising trend shows the addition of the already existing pool of HBV positive cases and the higher infection/exposure due to syringes and other modes. After this the figure did not change much though the injection rate went up to more than 10 injections per person per year. This shows once infected the adult population becomes immune to this virus following recovery, which occurs in over 90% cases. The downward trend of 5.2% shows immunity in the elderly population so although the numbers of injections are increasing but they are unable to produce the disease.

Table 59: Prevalence of HBsAg according to use of IM Injection in Balochistan Province

IM Injection	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	849	17	2.0	0.1 – 2.9
2-5	2936	122	4.2	3.4 – 4.9
5-10	1139	68	6.0	4.5 – 7.4
> 10	367	19	5.2	2.9 – 7.4
Total	5291	226	4.3	3.7 – 4.8

The use of new disposable syringe vs reused syringe

The use of a reused syringe was compared with the new syringe to see the trend of health care seekers and the providers and their awareness about the disease. It was seen that the HBV figures were much higher when the subject was provided injection with a reused syringe **(Table 60).**

Table 60: Prevalence of HBsAg according to type of syringes in Balochistan

Syringe Type	No. of Subjects	Prevalence of HBsAg		
		No.	%	95% Confidence Interval
None	849	17	2.0	1.0 - 2.9
New / Disposable	1682	53	3.2	2.3 - 4.0
Re-used	2130	118	5.5	4.5 - 6.4
Don't Know	630	38	6.0	4.2 - 7.9
Total	5291	226	4.3	3.7 - 4.8

Prevalence of anti HCV in Balochistan

A total of 5291 subjects were screened for HCV in Balochistan. There were 2639 males and 2652 females.

Distribution of HCV in both gender. The HCV prevalence figures were almost similar in both gender i.e. 1.4% males and 1.6% females **(Table 61)**. Equal affection of both gender indicates common sources of exposure in this population.

Table 61: Prevalence of HCV according to gender in Balochistan

Gender	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Male	2639	36	1.4	1.0 – 1.8
Female	2652	43	1.6	1.1 – 2.1
Total	5291	79	1.5	1.2 – 1.8

The anti HCV prevalence according to age: The distribution of HCV positive cases according to age in shown in **(Table 62)**. The HCV prevalence was 1% in children under 19 years of age. This figure increased gradually with the advancement of age and reached 4% at 60 years and above.

Table 62: Prevalence of HCV according to age in Balochistan

Age group	No. of Subjects	HCV		
		No.	%	95 Confidence Interval
Under 5 years	585	2	0.3	0.0 – 0.7
5-19	2151	15	0.7	0.3 – 1.1
20-29	870	13	1.5	0.7 – 2.3
30-39	661	16	2.4	1.2 – 3.6
40-49	487	14	2.9	1.4 – 4.4
50-59	274	9	3.3	1.2 – 5.4
60 & above	252	10	4.0	1.6 – 6.4
Don't know	11	-	-	-
Total	5291	79	1.5	1.2 – 1.8

Correlation of viral markers to marital status is shown in **(Table 63)**. The HCV prevalence increased from 0.8% in the never married group to 2.5% in the married group and the figures continued to go up to 4% in the divorced/separated group. The reason for this rising HCV in divorced and widow group is very different from other provinces and needs further evaluation or study.

Table 63: Prevalence of HCV according to marital status in Balochistan

Marital status	No. of Subjects	HCV		
		No.	%	95% Confidence Interval
Never Married	3215	25	0.8	0.5 – 1.1
Married	1977	50	2.5	1.8 – 3.2
Div. / Sep. / Widow	99	4	4.0	0.1 – 7.9
Total	5291	79	1.5	1.2 – 1.8

Injection use for common ailments

For HCV 1% figures were seen for individuals taking less than 5 injections per years, which is similar to figures of HCV in children **(Table 64).** This figures rose to 3.2% as the number of injections increased to 5-10.

Table 64: Prevalence of HCV according to number of injection use in Balochistan

IM Injection	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	849	1	0.1	0.0 - 0.4
< 5	2936	33	1.1	0.7 - 1.5
5-10	1139	36	3.2	2.1 - 4.2
> 10	367	9	2.5	0.9 - 4.0
Total	5291	79	1.5	1.1 - 1.8

The use of new disposable syringe vs reused syringe. The use of a reused syringe was compared with the new syringe to see the trend of health care seekers and the providers and their awareness about the disease. It was seen that the HCV figures were much higher when the subject was provided injection with a reused syringe **(Table 65).**

Table 65: Prevalence of HCV according to use of syringes in Balochistan

Syringe Type	No. of Subjects	Prevalence of HCV		
		No.	%	95% Confidence Interval
None	849	1	0.1	0.0 - 0.3
New / Disposable	1682	15	0.9	0.4 - 1.3
Re-used	2130	46	2.2	1.5 - 2.8
Don't Know	630	17	2.7	1.4 - 4.0
Total	5291	79	1.5	1.2 - 1.8

District wise Distribution of HBsAg and anti HCV

The sample size determination was basically targeted to get prevalence figures for HBV and HCV in the whole country and in the four provinces. To get the representative sample size all districts were included and sample drawn from them, but the sample size for each district might not exactly represent the actual population prevalence in that province, therefore figures shown for districts can give a fair idea about disease prevalence in that district but variations are possible.

District wise Distribution of HBsAg and anti HCV in Sindh

The overall HBsAg prevalence in Sindh was 2.5% and for HCV was 5% as shown earlier. The scatter within Sindh shows some districts/ areas with very high figures for HBV and some with high figures for HCV while some have high rate for both viruses. If we take figures of 2.5% as the baseline figures for HBV than Khairpur, Ghotki, Larkana, Nosheroferoz, Shikarpur, Jacobabad, Thatta, Mirpur Khas, Sanghar and Hyderabad had higher figures **(Table 66).** No HBV positive case was seen in Tharparkar and the possible reason of this low figure could be non-availability of allopathic health care provider or a person who could give injections. Most people in this remote area rely on herbal treatments, which they produce from the herbs growing in their area. Low figures in Karachi and Sukkur and other areas are probably related to high educational standards in these cities and protection from the virus through vaccination**.**

The HCV prevalence figures were 4.9% for Pakistan. Alarmingly high figures were seen in Ghotki (12.7%) followed by Sanghar, Dadu, Hyderabad, Thatta, Shikarpur, Jacobabad, Nawabshah and Mirpur Khas **(Table 67).**

Ghotki has the highest HBV and HCV rates and therefore is at a very risk of dual infections, high morbidity and mortality. Other areas where both HBV and HCV are high include Sanghar, Dadu, Hyderabad, Thatta, Jacobabad and Mirpur Khas. Special awareness and health education programs and vaccination drives need to be conducted on war footings along with screening of high risk individuals (belonging to HBV positive families) for vaccination and follow up.

Table 66: Prevalence of HBsAg according to district of Sindh

Province Sindh	No. of persons Screened	HBsAg		Total Population (2004)	Affected Population (Approximately)
		No	%		
Khairpur	479	30	6.3	1,773,000	112,000
Ghotki	205	12	5.9	1,112,000	66,000
Larkana	421	18	4.3	2,209,000	95,000
Nosheroferoz	225	9	4.0	1,247,000	50,000
Shikarpur	300	10	3.3	1,009,000	33,000
Jacobabad	396	13	3.3	1,634,000	54,000
Thatta	392	12	3.1	1,276,000	40,000
Mirpur Khas	569	17	3.0	1,039,000	31,000
Sanghar	653	18	2.8	1,666,000	47,000
Hyderabad	1084	28	2.6	3,315,000	86,000
Dadu	511	11	2.2	1,936,000	43,000
Badin	356	6	1.7	1,302,000	22,000
Nawabshah	364	6	1.6	1,228,000	20,000
Sukkur	456	7	1.5	1,041,000	16,000
Karachi	2190	30	1.4	11,296,000	158,000
Tharparkar	308	0	0.0	1,808,000	0000
Total	**8909**	**227**	**2.5**	**34,891,000**	**872,000**

Table 67: Prevalence of HCV according to district of Sindh

District of Sindh Province	No. of persons Screened	HCV		Total Population (2004)	Affected Population (Approximately)
		No	%		
Ghotki	205	26	12.7	1,112,000	141,000
Sanghar	653	51	7.8	1,666,000	130,000
Dadu	511	37	7.2	1,936,000	139,000
Hyderabad	1084	62	5.7	3,315,000	189,000
Thatta	392	21	5.4	1,276,000	689,000
Shikarpur	300	16	5.3	1,009,000	53,000
Jacobabad	396	21	5.3	1,634,000	87,000
Nawabshah	364	18	4.9	1,228,000	60,000
Mirpur Khas	569	28	4.9	1,039,000	51,000
Badin	356	16	4.5	1,302,000	59,000
Karachi	2190	91	4.2	11,296,000	474,000
Tharparkar	308	12	3.9	1,808,000	71,000
Sukkur	456	17	3.7	1,041,000	39,000
Khairpur	479	16	3.3	1,773,000	59,000
Nosheroferoz	225	7	3.1	1,247,000	39,000
Larkana	421	9	2.1	2,209,000	46,000
Total	**8909**	**448**	**5.0**	**34,891,000**	**1,745,000**

District wise Distribution of HBsAg and anti HCV in Punjab

The overall HBsAg prevalence in Punjab was 2.4% and for HCV it was 6.7% as shown earlier. The districts/areas showing higher than 2.5% figures for HBV include DG Khan, R.Y Khan, Jhang, Islamabad, Rajanpur, Mandi Bhauddin, Layyah, Tobatek Singh Gujranwalla, Vehari, Okara, Attock, Mianwali, Chakwal and Muzaffargarh **(Tables 68, 69).**

Table 68: Prevalence of HBsAg according to district of Punjab

District of Punjab Province	No. of persons Screened	HBsAg		Total Population (2004)	Affected Population (Approximately)
		No	%		
Dera Ghazi Khan	577	33	5.7	1,865,000	106,000
Islamabad	591	33	5.6	1,025,000	57,000
Rahimyar Khan	773	36	4.7	3,565,000	168,000
Jhang	885	36	4.1	3,217,000	132,000
Rajanpur	423	17	4.0	1,253,000	50,000
Mandi Bahauddin	396	15	3.8	1,317,000	50,000
Layyah	432	16	3.7	1,272,000	47,000
Toba Taik Singh	718	23	3.2	1,841,000	59,000
Gujranwala	926	27	2.9	3,860,000	112,000
Okara	844	24	2.8	2,534,000	71,000
Attock	529	15	2.8	1,447,000	41,000
Mianwali	425	12	2.8	1,199,000	34,000
Vehari	428	12	2.8	2,373,000	66,000
Chakwal	414	11	2.7	1,230,000	33,000
Muzaffarghar	872	22	2.5	2,992,000	75,000
Jehlam	414	10	2.4	1,064,000	26,000
Sahiwal	424	10	2.4	2,092,000	50,000
Bahawalnagar	723	17	2.4	2,340,000	56,000
Caser	535	12	2.2	2,696,000	59,000
Sialkot	1143	25	2.2	3,091,000	68,000
Hafizabad	511	11	2.2	945,000	21,000
Sargodha	1129	24	2.1	3,026,000	64,000
Bahawalpur	942	20	2.1	2,761,000	58,000
Narowal	472	10	2.1	1,436,000	30,000
Khoshab	561	11	2.0	1,028,000	21,000
Rawalpindi	1012	18	1.8	3,818,000	69,000
Lodhran	284	5	1.8	1,330,000	24,000
Sheikhupura	1172	19	1.6	3,769,000	60,000
Multan	1019	16	1.6	3,537,000	57,000
Lahore	1984	28	1.4	7,171,000	100,000
Bhakkar	589	7	1.2	1,193,000	14,000
Faisalabad	1616	19	1.2	6,162,000	74,000
Khanewal	423	4	0.9	2,348,000	21,000
Gujrat	616	5	0.8	2,325,000	19,000
Pakpattan	404	3	0.7	1,460,000	10,000
Total	**25206**	**606**	**2.4**	**84,582,000**	**2,030,000**

Table 69: Prevalence of HCV according to district of Punjab

Province Punjab	No. of persons Screened	HCV		Total Population (2004)	Affected Population (Approximately)
		No	%		
Vehari	428	56	13.1	2,373,000	311,000
Hafizabad	511	66	12.9	945,000	122,000
Pakpattan	404	43	10.6	1,460,000	155,000
Bahawalnagar	723	73	10.1	2,340,000	236,000
Bahawalpur	942	93	9.9	2,761,000	273,000
Okara	844	80	9.5	2,534,000	241,000
Sheikhupura	1172	102	8.7	3,769,000	328,000
Jhang	885	77	8.7	3,217,000	280,000
Faisalabad	1616	137	8.5	6,162,000	524,000
Multan	1019	75	7.4	3,537,000	262,000
Rawalpindi	1012	74	7.3	3,818,000	279,000
Toba Taik Singh	718	52	7.2	1,841,000	133,000
Sahiwal	424	30	7.1	2,092,000	149,000
Sialkot	1143	80	7.0	3,091,000	216,000
Lahore	1984	134	6.8	7,171,000	488,000
Lodhran	284	19	6.7	1,330,000	89,000
Attock	529	35	6.6	1,447,000	96,000
Rahimyar Khan	773	51	6.6	3,565,000	235,000
Mandi Bahauddin	396	26	6.6	1,317,000	87,000
Gujranwala	926	58	6.3	3,860,000	243,000
Mianwali	425	23	5.4	1,199,000	65,000
Gujrat	616	33	5.4	2,325,000	126,000
Kasur	535	28	5.2	2,696,000	140,000
Sargodha	1129	55	4.9	3,026,000	148,000
Khanewal	423	19	4.5	2,348,000	106,000
Dera Ghazi Khan	577	25	4.3	1,865,000	80,000
Islamabad	591	24	4.1	1,025,000	42,000
Narowal	472	19	4.0	1,436,000	57,000
Layyah	432	16	3.7	1,272,000	47,000
Jehlam	414	13	3.1	1,064,000	33,000
Khoshab	561	16	2.9	1,028,000	30,000
Bhakkar	589	15	2.5	1,193,000	30,000
Rajanpur	423	10	2.4	1,253,000	30,000
Chakwal	414	9	2.2	1,230,000	27,000
Muzaffarghar	872	17	1.9	2,992,000	57,000
Punjab	**25206**	**1683**	**6.7**	**83,637,000**	**5,604,000**

For HCV the areas/districts showing higher than national figures were many **(Table 69)** with Vehari showing the highest figures of 13.1% followed by Hafizabad 12.9%, Pakpattan (10.6%), Bahawalnagar (10.1%), Bahawalpur (9.9%), Okara (9.5%) and Shaikupura and Jhang having same figures of 8.7%**.**

High HBV and HCV are seen in Vehari, Okara, Jhang, Islamabad, Attock, Rahim Yar Khan, Mandi Bhauddin, Gujranwalla and Mianwali. Special programs need to be initiated and implemented in these areas to combat dual infection and its related morbidity and mortality and difficulties in clearing the co infections. Serious work needs to be done on the provincial levels to reduce the already high figures of both these viruses.

District wise Distribution of HBsAg and anti HCV in NWFP

The overall HBsAg prevalence in NWFP was 1.3% and for HCV it was 1.1% as shown earlier. High HBV figures seen in Upper Dir (5%), Lower Dir (3.2%) and Bannu (2.7%) **(Tables 70, 71).**

Table 70: Prevalence of HBsAg according to district of NWFP

District of NWFP Province	No. of persons Screened	HBsAg		Total Population (2004)	Affected Population (Approximately)
		No	%		
Upper Dir	181	9	5.0	664,000	33,000
Lower Dir	187	6	3.2	828,000	26,000
Bannu	401	11	2.7	781,000	21,000
Charsadda	313	7	2.2	1,179,000	26,000
Hango	283	6	2.1	363,000	8,000
Malakand	384	8	2.1	522,000	11,000
Tank	251	5	2.0	275,000	6,000
Dera Ismail Khan	449	8	1.8	983,000	18,000
Karak	362	6	1.6	497,000	8,000
Mardan	467	7	1.5	1,684,000	25,000
Laki Marwat	268	4	1.5	565,000	8,000
Noshera	484	7	1.4	1,008,000	14,000
Peshawar	864	8	0.9	2,328,000	21,000
Chitral	283	2	0.7	368,000	3,000
Swat	329	2	0.6	1,450,000	9,000
Mansehra	357	1	0.3	1,330,000	4,000
Batagram	111	0	0.0	354,000	000
Kohistan	105	0	0.0	545,000	000
Swabi	539	0	0.0	1,184,000	000
Kohat	357	0	0.0	649,000	000
Abbottabad	231	0	0.0	1,016,000	000
Haripur	227	0	0.0	798,000	000
Shangla	204	0	0.0	501,000	000
Total	**7637**	**97**	**1.3**	**19,863,000**	**258,000**

Table 71: Prevalence of anti HCV according to district of NWFP

Province NWFP	No. of persons Screened	HCV		Total Population (2004)	Affected Population (Approximately)
		No	%		
Hango	283	18	6.4	363,000	23,000
Swat	329	10	3.0	1,450,000	43,000
Batagram	111	3	2.7	354,000	10,000
Mardan	467	10	2.1	1,684,000	35,000
Malakand	384	6	1.6	522,000	8,000
Bannu	401	6	1.5	781,000	12,000
Peshawar	864	10	1.2	2,328,000	28,000
Charsadda	313	3	1.0	1,179,000	12,000
Kohistan	105	1	1.0	545,000	5,000
Noshera	484	4	0.8	1,008,000	8,000
Laki Marwat	268	2	0.7	565,000	4,000
Swabi	539	4	0.7	1,184,000	8,000
Kohat	357	2	0.6	649,000	4,000
Mansehra	357	2	0.6	1,330,000	8,000
Lower Dir	187	1	0.5	828,000	4,000
Tank	251	1	0.4	275,000	1,000
Chitral	283	1	0.4	368,000	1,000
Abbottabad	231	0	0.0	1,016,000	000
Dera Ismail Khan	449	0	0.0	983,000	000
Haripur	227	0	0.0	798,000	000
Shangla	204	0	0.0	501,000	000
Karak	362	0	0.0	497,000	000
Upper Dir	181	0	0.0	664,000	000
NWFP	**7637**	**84**	**1.1**	**19,872,000**	**219,000**

For HCV higher figures were seen in Hungo (6.4%) and Swat (3%) **(Table 71)**.

District wise Distribution of HBsAg and anti HCV in Balochistan

The overall HBsAg prevalence in Balochistan was 4.3% and for HCV it was 1.5% as shown earlier. Exceptionally high figures for HBsAg were seen in Musa Khel where the figures were 14.7% followed by Loralai (7.4%), Sibi (7.3%), Kohlu (6.7%), Khuzdar (5.8%), Zhoab and Jafarabad had similar figures (5.5%), Kalat (5.4%), Barkhan (5.3%), Kharan (4.8%) and Chagi & Nasirabad had similar figures (4.6%) **(Table 72).** Very special hepatitis B prevention programs need to be implemented all over Balochistan to combat the vaccine preventable disease.

For HCV high figures were seen in Musa Khel (5.3%), Jafarabad (5.2%), Barkhan (3.8%), Zhoab (3.7%) and Loralai (3.3%) **(Table 73).**

Table 72: Prevalence of HBsAg according to district of Balochistan

BALOCHISTAN	No. of persons Screened	HBsAg		Total Population (2004)	Affected Population (Approximately)
		No	%		
Musakhel	95	14	14.7	155,000	23,000
Loralai	244	18	7.4	344,000	25,000
Sibi	248	18	7.3	209,000	15,000
Kohlu	180	12	6.7	115,000	8,000
Khuzdar	342	20	5.8	483,000	28,000
Jaffarabad	385	21	5.5	501,000	28,000
Zhob	219	12	5.5	318,000	17,000
Kalat	279	15	5.4	275,000	15,000
Barkhan	133	7	5.3	120,000	6,000
Kharan	145	7	4.8	239,000	11,000
Nasirabad/Tamboo	326	15	4.6	285,000	13,000
Chagi	153	7	4.6	234,000	11,000
Ziarat	201	7	3.5	39,000	1,000
Awaran	148	5	3.4	137,000	5,000
Lasbela	242	8	3.3	362,000	12,000
Turbat	277	9	3.2	478,000	15,000
Qila Saifullah	304	7	2.3	224,000	5,000
Quetta	451	10	2.2	879,000	19,000
Pishin	329	7	2.1	425,000	9,000
Mastung	158	3	1.9	191,000	4,000
Gawadar	190	2	1.1	215,000	2,000
Panjoor	115	1	0.9	271,000	2,000
Bolankachi	127	1	0.8	333,000	3,000
BALOCHISTAN	**5291**	**226**	**4.3**	**6,832,000**	**294,000**

Table 73: Prevalence of anti HCV according to district of Balochistan

District of Balochistan Province	No. of persons Screened	HCV		Total Population (2004)	Affected Population (Approximately
		No	%		
Musa Khel	95	5	5.3	155,000	8,000
Jaffarabad	385	20	5.2	501,000	26,000
Barkhan	133	5	3.8	120,000	5,000
Zhob	219	8	3.7	318,000	12,000
Loralai	244	8	3.3	344,000	11,000
Nasirabad/Tamboo	326	9	2.8	285,000	8,000
Mastung	158	3	1.9	191,000	4,000
Quetta	451	7	1.6	879,000	14,000
Awaran	148	2	1.4	137,000	2,000
Lasbela	242	3	1.2	362,000	4,000
Khuzdar	342	4	1.2	483,000	6,000
Pishin	329	2	0.6	425,000	3,000
Kohlu	180	1	0.6	115,000	1,000
Turbat/Kech	277	1	0.4	478,000	2,000
Qila Saifullah	304	1	0.3	224,000	1,000
Sibi	248	0	0.0	209,000	000
Kalat	279	0	0.0	275,000	000
Kharan	145	0	0.0	239,000	000
Chagi	153	0	0.0	234,000	000
Ziarat	201	0	0.0	39,000	000
Gawadar	190	0	0.0	215,000	000
Panjgoor	115	0	0.0	271,000	000
Bolankachi	127	0	0.0	333,000	000
BALOCHISTAN	**5291**	**79**	**1.5**	**6,832,000**	**102,000**

HBsAg and anti HCV in Children

HBsAg and anti HCV in Children under 19 years of age

National Prevalence

In the present survey all household family members irrespective of age and gender were included and all underwent blood testing. Out of a total of 47043 subjects screened for viral markers, 22585 were children aged less than and equal to 19 years representing almost 48% of the sample size.

For the sake of analysis children were divided into 2 groups of under 5 years and those between 5-19 years. Overall prevalence of HBsAg was 1.7% and for HCV was 2% **(Table 74).**

Table 74: Prevalence of HBsAg and HCV in Children

Age group	No of Subjects	HBsAg		HCV	
		No.	%	No.	%
Under 5 years	4188	53	1.3	79	1.9
5-19	18397	329	1.8 *	378	2.1
Total	22585	382	1.7	457	2.0

* Prevalence of HBV were significantly high in 5-19 years as compared to under 5 years $P<0.05$ and prevalence of HCV were not significant difference 5-19 years and under 5 years

When analyzed according to 2 age groups, about 1.3% children under the age of 5 years were HBsAg positive, and this percentage went significantly up to 1.8% in children aged 5-19 years. The exposure in less than 5 years age group is disturbing because this shows the possibility of vertical transmission from the mother to the new born or some horizontal transmission through contaminated devices used during head shaving, cutting of umbilical cord and circumcision. There is a chance that many of these children might be carrying the infectious part of the virus; called the HBeAg which is transmitted from the mother to the new born. About 90% of such children will therefore develop chronic liver disease later in life. A significant rise in HBsAg in children aged between 5-19 years is also worrying as some of these children are likely to either carry the virus in its silent form called as hepatitis B carriers while others will progress to chronic liver disease.

For HCV the prevalence was 1.9% in children under 5 years of age and this went up to 2.1% in those aged 5-19 years. The mothers, who are HCV positive tests, are likely to transmit the virus to their new born children, through passive immunization. Majority of these new born children clear the virus in 24 months and become HCV negative. It is therefore recommended that HCV testing of the new born should not be done before 24 months of age so as to pick only infectious children. Mothers who have high viral count (HCVRNA) and raised liver function are more likely to transmit the active disease to the new born and chances of these children getting infected are about 20%.

Prevalence of HBsAg and anti HCV in children under 5 years in different Provinces

The prevalence of viral markers in 4 provinces is shown in **Table 75.**

Table 75: HBsAg and HCV prevalence in children under 5 years of age

Province	No of Subjects	HBsAg		HCV	
		No.	%	No.	%
Sindh	876	10	1.1	8	0.9
Punjab	2055	30	1.5	69	3.4
NWFP	672	1	0.1	0	0.0
Balochistan	585	12	2.1	2	0.3
Total	4188	53	1.3	79	1.9

Prevalence of HBV were significantly high in Balochistan (2.1%) and then Punjab (1.5%) and prevalence of HCV were significantly high in Punjab (3.4%) and then Sindh (0.9%) as compared to other provinces $P<0.01$

The HBsAg prevalence was highest in Balochistan where the figures were 2.1%, followed by 1.5% in Punjab, 1.1% in Sindh and 0.1% in NWFP. High figures in Balochistan need to be taken seriously by EPI and the other National programs which are looking into disease containment and prevention. Balochistan has the highest HBV prevalence rates in adult population and children are no exception. Early exposure to HBV virus in these children means thousands of more carriers and millions of disease sufferers in the long run. Punjab is the next province in line where drastic measures need to be taken for vaccination of new born children and screening of all family members where one index case is found.

The prevalence of HCV was highest in Punjab where a figure of 3.4% was seen in children less than 5 years of age. Figures in Sindh and Balochistan were less than 1% while none were seen in NWFP.

The high prevalence of HCV in children less than 5 years of age in Punjab means either a maternal exposure or horizontal exposure through syringes for injections used for common ailments and blades used for head shaving. With such a high exposure in childhood there is a very likelihood that majority of these children will develop chronic liver disease in next 15-20 years and a sizeable number will end up having irreversible cirrhosis and its complications.

The Provincial government has to take a serious notice of the disease and implement safe practices to protect their future generation.

Prevalence of HBsAg and anti HCV in children between 5-19 years in different Provinces

The prevalence of viral markers in children aged 5-19 years in 4 Provinces is shown in **(Table 76).** Of the total 22585 children screened, 18397 (39%) were between 5-19 years.

Table 76: HBsAg and HCV prevalence in children between 5-19 years

Province	No of Subjects	HBsAg		HCV	
		No.	%	No.	%
Sindh	3390	70	2.1	53	1.6
Punjab	9839	165	1.7	300	3.0
NWFP	3017	34	1.1	11	0.4
Balochistan	2151	60	2.8	15	0.7
Total	18397	329	1.8	379	2.1

Prevalence of HBV were significantly high in Balochistan (2.8%) and then Sindh (2.1%) and prevalence of HCV were significantly high in Punjab (3.0%) and then Sindh (1.6%) as compared to other two provinces $P<0.01$

The prevalence of HBsAg was again highest in Balochistan where the figures were 2.8% followed by Sindh (2.1%), Punjab (1.7%) and NWFP (1.1%). The rise in these figures was significantly high when compared to the figures in less than 5 years age group. This rise in figures indicates horizontal transmission in a sizable number of children.

The prevalence figures for HCV were almost similar to those seen in the children less than 5 years of age with highest figures seen in Punjab (3%), followed by Sindh (1.6%), Balochistan (0.7%) and NWFP (0.4%). HCV antibodies are mostly permanent therefore once positive they remain positive for life and very few people loose them over time.

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