Wycliffe Onyango - Radiographer, Madiany Sub County Hospital, Siaya prepares to take an X-ray of a fisherfolk member using the digital chest x-ray machine placed rolled out in the county by the Ministry of Health's N

Improving TB Case Finding through the Use of Computer Aided Diagnosis for TB Chest X-ray in Siaya County

By Diana Munjuri CHS - USAID TB ARC II

Siaya County located in the Nyanza region of Kenya is one of the high TB/HIV burden counties in Kenya. According to the County TB, Leprosy and Lung Disease Coordinator, Mary Wambura, the County TB notification rate is 310 per 100000 population. Though the burden is high, a lot of progress has been made in the fight against the disease in the county.

The Ministry of Health's National TB Program in collaboration with the Siaya County government and implementing partners among them Centre for Health Solutions – Kenya (CHS) through the USAID supported Tuberculosis Accelerated Response and Care II (USAID TB ARC II) and

Introducing Tools Project (iNTP) have accelerated efforts to find the missing cases by rolling out a Computer Aided Diagnosis for TB Chest X-ray (CAD4TB CXR) at Madiany Sub County Hospital in the county.

"Previously before the rollout of the CAD4TB CXR, we used to mobilize for the national chest x-ray to come all the way from Nairobi. This was a costly affair and we could not achieve much because it would be for few days as well as we would have the screening happen very few times in a year," Mary shares.

In July 2022, a CAD4TB CXR machine was placed in the facility after an assessment which entailed the

capacity of the facility to accommodate the machine in a safe and spacious space while ensuring the safety of the patients and staff from the machine radiation rays. A trained radiographer and linkage assistant were also brought on board.

"We really deserved this machine. In a day we serve an average of 200-300 clients of which 10 are likely to be TB patients in a month against our target of six patients. Compared to last year, our TB diagnosis has increased by 50% meaning we were missing cases as a result of the absence of the machine," Dr Felix Oloo, Madiany sub county hospital Medical superintendent explains.

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The catastrophic costs brought about by the referral of clients for X-rays services in the nearest facilities deterred many from seeking the service due to their low social economic status.

"We would suspect clients for TB and send them for x-ray but majority would not due to the costs that would be incurred to access the service. Some would opt for over-the-counter medicine which is cheaper at most Kshs.300 as opposed to incurring Kshs.1000 for transport and Kshs. 600 for the x-ray to be taken. These clients would later present in the facility after the disease has progressed often leading to death or life-threatening lung damage due to late diagnosis. This also meant there was a lot of transmission in the community ," Danvas Nyakwira, Madiany sub county hospital, TB/HIV clinician shares.

Since its roll out in the facility, its utilisation has been optimal both within and outside the County. The machine is used to carry out targeted TB outreaches within and outside the county in among others the fisherfolk community in the islands and overpopulated areas like market places and slums. So far over 4000 clients have been screened for TB using the machine as of March 2023.
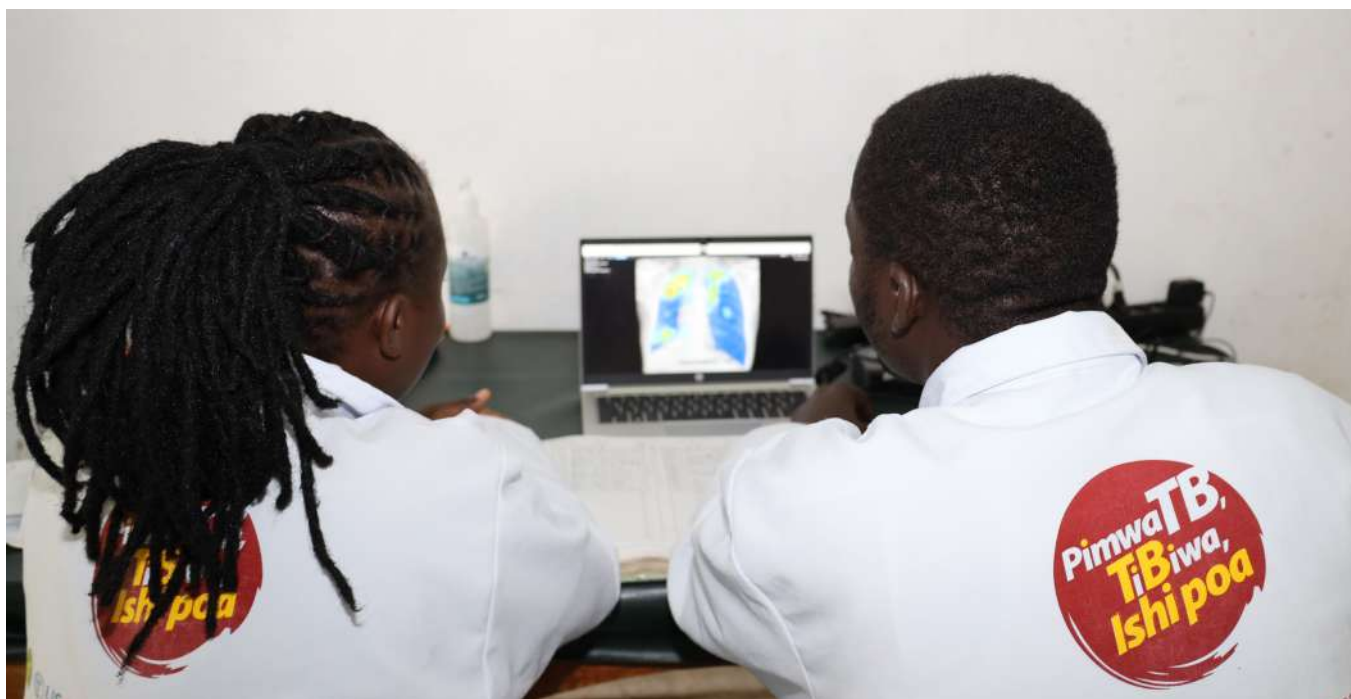
Dr. Felix praises the efficiency of the CAD4TB CXR machine for TB screening services, highlighting several advantages. Firstly, the machine is provided free of charge, ensuring access to all patients regardless of their socio-economic status. Secondly, it has a short turnaround time for releasing and interpreting results. Thirdly, its portability allows healthcare workers to reach patients directly, reducing disease transmission and the financial burden on patients. Dr. Felix also emphasizes the ease of use, with an artificial intelligence component linked to the TIBULIMS system for result relay. This eliminates the need to physically collect results and allows for remote monitoring. Furthermore, the machine's maintenance is cost-effective as it can be digitally maintained by suppliers, eliminating the need for travel and potential service delays.

Wycliff Onyango, a facility radiographer, praises the efficiency and effectiveness of the machine he operates, which involves taking x-ray images and utilizing the built-in artificial intelligence for interpretation. During outreach programs, they screen approximately 100 patients daily, and in a healthcare facility, an average of 20 patients. If a patient scores above 60, they are referred to clinicians who then send them for a sputum test to confirm tuberculosis (TB). Wycliff emphasizes the user-friendly nature of the machine, as it assists him in interpreting various opacities in the x-ray images. He considers this machine superior to others, providing him with satisfaction when diagnosing patients, initiating treatment, and witnessing their health improvement.

Dissemination of information on the availability of the CAD4TB CXR machine at Madiany has prompted neighboring both private and public

Wycliffe Onyango- Radiographer and Valery Atieno-Linkage Assistant at Madiany Sub County Hospital look through an X-ray taken by the digital chest x-ray machine placed in the facility by the Ministry of Health's National TB Program

facilities to be referring their patients for chest x-ray services there.

Jane Otieno, the TB/HIV nursing officer at Mama Anns Odede Community Health Centre, highlights the positive impact of having the CAD4TB CXR machine available near their facility in Madiany for diagnosing tuberculosis. Previously, they had to refer clients to distant hospitals, which posed challenges due to transportation costs and the x-ray fees. Many clients couldn't afford to go or delayed seeking help, resulting in late diagnoses and increased community transmission. However, with the CAD4TB CXR machine, they now screen clients on-site and accompany those who require further screening to Madiany free of charge, using either a motorbike or ambulance. If TB is detected, they initiate treatment and provide ongoing management. So far, they have successfully diagnosed and are managing 19 patients.

Fredrick Ochieng, a 35-year-old carpenter, had been experiencing persistent symptoms including coughing, night sweats, and loss of appetite. Initially, he tried over-the-counter medication, but there was no improvement. On December 21, 2022, he sought treatment at Mama Anns Odede Community Health Centre, where he was referred to Madiany for a chest x-ray. The results were shared with the clinician, who recommended further testing with a sputum sample. Upon receiving the diagnosis of TB, Fredrick received counseling on the disease, its causes, and prevention measures, and he was promptly initiated on treatment. Since starting treatment, he has experienced significant improvement, with his

symptoms disappearing and his ability to provide for his family restored. Fredrick's household members were also screened for TB, and as they were found to be free of the disease, they were placed on preventive therapy. Fredrick expresses gratitude for the availability of the free machine, which played a vital role in diagnosing their condition and providing timely treatment.

George Nyauchi, a 60-year-old tailor, had been suffering from night sweats, chest pain, and severe coughing for over six months, attributing it to the progression of his asthma. Despite seeking medical help from various hospitals and trying over-the-counter medication, his health continued to deteriorate. However, a glimmer of hope emerged when a friend who had undergone chest x-ray screening informed him about it.

The next day, George arrived at Madiany Sub County Hospital in a bedridden state, and after an examination, a chest x-ray revealed abnormalities in his lungs with a score above 60. Further testing with a sputum sample confirmed the diagnosis of TB. He received counseling on the disease, its transmission prevention, and the importance of adhering to treatment, and he was promptly initiated on treatment.

Since starting treatment in July of the previous year and completing it in January, George's health has significantly improved. His symptoms, including chest pain, coughing, and night sweats, have disappeared, and the frequency of his asthma attacks has decreased. George has regained his energy and returned to his tailoring job, even progressing to training

others in the trade. He has gained weight, going from 56 kg to 75 kg. George expresses his gratitude for the availability of the machine that has not only saved his life but also the lives of others in their community. He has referred several individuals with TB symptoms for screening and treatment, and they are all progressing well.

He adds "I have since gone back to my tailoring job that has since progressed to training other people since I feel more energetic now. My weight has improved from 56 kgs to 75 kgs. I am grateful that as a community we are privileged to have benefitted from this machine that has saved my life plus that of others. I have referred several people who have seen with TB symptoms here, were screened and those found with the disease have also been initiated on treatment and are progressing on well."

Stella Omulo, USAID TB ARC II Nyanza Regional Officer recommends the scale-up of the CAD4TB chest X-ray machine to every GeneXpert site as per the WHO guidelines to ensure targeted testing and reduction in cartridge wastage.

"The screening of the clients using the digital chest x-ray machine before sending them to the laboratory has reduced cartridge wastage as it has reduced the number of people who go to the laboratory. Data from this facility shows that at least 2 of 10 people sent to the laboratory will turn positive for TB hence we have targeted testing and reduction in cartridge wastage," Stella says.

Stella notes that the digital machine has a capability of releasing a colour coded x-ray with a score of >60 being TB presumptive makes it easy for health workers to review the results and make a diagnosis efficiently and provide quality of care to patients behold TB.

She concludes by noting that they will soon be publishing best practices publications with data justifications for reference in the scale up on the utilization of the machine in other places. ●

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