

**ORIGINAL RESEARCH**

## Point-of-Care Testing for Anemia, Diabetes, and Hypertension: A Pharmacy-Based Model in Lima, Peru

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**Abstract**

**BACKGROUND** Prevention and control of chronic diseases is a high priority for many low- and middle-income countries. This study evaluated the feasibility and acceptability of training pharmacy workers to provide point-of-care testing for 3 chronic diseases—hypertension, diabetes, and anemia—to improve disease detection and awareness through private pharmacies.

**METHODS** We developed a multiphase training curriculum for pharmacists and pharmacy technicians to build capacity for identification of risk factors, patient education, point-of-care testing, and referral for abnormal results. We conducted a pre-post evaluation with participants and evaluated results using Student *t* test for proportions. We conducted point-of-care testing with pharmacy clients and evaluated acceptability by patient characteristics (age, gender, and type of patient) using multiple logistic regression.

**RESULTS** In total, 72 pharmacy workers (66%) completed the full training curriculum. Pretest scores indicated that pharmacists had more knowledge and skills in chronic disease risk factors, patient education, and testing than pharmacy technicians. All participants improved their knowledge and skills after the training, and post-test scores indicated that pharmacy technicians achieved the same level of competency as pharmacists ( $P < .01$ ). Additionally, 698 clients received at least 1 test during the study; 53% completed the acceptability survey. Nearly 100% thought the pharmacy could provide faster results, faster and better attention, and better access to basic screening for hypertension, diabetes, and anemia than a traditional health center. Fast service was very important: 41% ranked faster results and 30% ranked faster attention as the most important factor for receiving diagnostic testing in the pharmacy.

**DISCUSSION** We found that it is both feasible for pharmacies and acceptable to clients to train pharmacy workers to provide point-of-care testing for anemia, diabetes, and hypertension. This innovative approach holds potential to increase early detection of risk factors and bolster disease prevention and management efforts in Peru and other low- and middle-income settings.

**KEY WORDS** point-of-care testing, POC test, rapid test, anemia, diabetes, hypertension, pharmacies, Peru

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The authors declare no conflict of interest.

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## INTRODUCTION

Prevention and control of chronic diseases, such as diabetes, anemia, and hypertension, has become an increasingly high priority for low- and middle-income countries (LMICs).<sup>1,2</sup> In Peru, these chronic illnesses represent a growing portion of the disease burden.<sup>3–7</sup> In addition to effects on morbidity and mortality, chronic diseases may negatively affect the social and economic health of Peruvian communities.<sup>7–9</sup> As such, the Peruvian government, researchers, and policymakers are beginning to look toward innovative health care delivery models that provide a comprehensive approach for chronic disease prevention, detection, and management.<sup>10–12</sup> One potential model that we evaluate in this paper is the provision of care, through pharmacies and drugstores, specifically targeted at hypertension, diabetes, and anemia.

Hypertension is one of the most prevalent risk factors for noncommunicable diseases in Peru, afflicting 12%–30% of the population.<sup>3,4,13–15</sup> If left uncontrolled, hypertension can lead to more serious cardiovascular events, such as heart disease.<sup>16</sup> Glucose abnormalities and diabetes also represent a significant portion of the disease burden in Peru, with prevalence ranging from 2%–20%, depending on the population.<sup>4,5</sup> Anemia affects 1.62 billion people globally and can cause delayed mental and physical development, fatigue, decreased work productivity, and increased risk of mortality.<sup>6</sup> Pregnant women and children younger than age 5 years have the highest prevalence of anemia because of increased iron requirements; pregnant women are also at highest risk for anemia-related mortality.<sup>17</sup> In Peru, 40.4% of women of fertile age and 42.7% of pregnant women suffer anemia (defined as <11 g/dL for these groups).<sup>6</sup>

Unfortunately, as in many LMICs, individual awareness, treatment, and control of chronic diseases remain low in Peru. Among those suffering from hypertension, less than half are aware that they have the condition and even fewer are treated.<sup>14,18</sup> Among diabetic individuals, the level of suboptimal glycemic control has been estimated to be 78% across Latin America and 97% in Peru.<sup>19</sup> Finally, 39% of children younger than 5 years and 21% of women of fertile age who are diagnosed with anemia in Peru receive no treatment.<sup>20</sup>

The World Health Organization has promoted better integration and use of community pharmacies to address the gap in diagnosis and treatment of chronic diseases.<sup>21</sup> In Peru, pharmacies and drugstores (also known as *boticas*) play a large role in

the health care system, often serving as the first point of care for people seeking medical advice or attention. Of the 54.3% of people who needed medical attention and actually received it in the last year, 61% went to a pharmacy, whereas only 39% went to a public health care facility.<sup>22</sup> Additionally, the average demand for services in the last 8 years increased by 2.9% for pharmacies but decreased by 1.1% for public health care centers.<sup>22</sup>

Previous studies have determined that pharmacies can be leveraged to successfully implement public health programs in Peru. One study found that pharmacy workers can be trained to provide health promotion services related to sexually transmitted diseases, their symptoms, detection of cases, and appropriate referral to clinicians to improve disease management.<sup>23</sup> In another recent qualitative study evaluating patient preferences for maternal health point-of-care (POC) testing, individuals indicated that pharmacies would be acceptable delivery sites for diagnostic testing.<sup>24</sup> Additionally, governmental strategies are currently being implemented in collaboration with private pharmacies to improve access to medications for publicly insured individuals.<sup>25</sup>

Building off these prior successes, our study assessed the potential for using pharmacies as critical access points for diagnosis, health promotion, and treatment of chronic diseases. Nurses, clinicians, and other health care providers traditionally perform diagnostic testing in Peru, but this task is within the jurisdiction of pharmacy workers' licensures and could be provided in the pharmacy, along with referral for abnormal results, disease prevention education, and medication adherence counseling. To that end, we implemented and evaluated a chronic disease management pilot program integrating rapid diagnostic equipment and POC testing for hypertension, diabetes, and anemia into pharmacies to improve screening, diagnosis, and control of these diseases.

## OBJECTIVES AND HYPOTHESIS

Our main study objective was to assess the feasibility and acceptability of training pharmacy workers to provide POC testing for anemia, diabetes, and hypertension in private pharmacies. The target population was 2-fold: (1) pharmacists and pharmacy technicians to be trained in POC testing and interpretation; and (2) pharmacy clients with particular focus on those at highest risk for developing anemia, diabetes, and hypertension: adult women of reproductive age (18–49 years), pregnant adult women,

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