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EVALUATION OF EARLY DETECTION PROGRAM OF HYPERTENSION AND DIABETES MELLITUS AT AL-KARKH SECTOR FOR PRIMARY HEALTH CARE /BAGHDAD

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ABSTRACT: *Backgroun**d**-Both of hypertension and diabetes represent serious problems of public health importance with significant morbidity and mortality, fortunately the natural history of both of them is well studied and either one of them have preclinical (asymptomatic) stage with availability of screening and diagnostic tools, this make both diseases suitable for screening, aiming to early detection and control of both of them **Aim of the study:** to **1)**determine how often client of al-Karkh sector are screened for hypertension &diabetes through the existing program 2) estimate screening efficiency based on :The number needed to screen to diagnose one case in the whole program, for hypertension & diabetes mellitus respectively &How often the program affects the prevalence of the diseases .**Design:** Across-sectional study from the 1st of Jan. to the 31st of Dec. 2011 of 12 primary health care centers at Al -Karkh sector using a statistical form approved by Iraqi MOH. **Results:** The coverage rate was 94.58% of number should be screened, the detection ability of the program was 2.11% for both diseases while number needed to screen to diagnose one case in the whole program was 47, there was an increase in the prevalence of both diseases by 2% with application of the program, the ratio of cases diagnosed by the program to those diagnosed outside the program was 1:5.6. **Conclusions** Most of cases of hypertension and diabetes at Al-Karkh sector were diagnosed outside the program and about half of those involved in the program didn't return for the second diagnostic test, this make the overall results of the program low. This low yield result should not be a barrier against program application but should be appoint for program modification since there's a lot of evidences that supports its value for better control & prevention of complications of both diseases.*

KEYWORDS: Coverage Rate, Number Needed To Screen (NNS),Detection Ability(DA),Number Screened(NS), Positive Screened Test (+Ve ST)

INTRODUCTION

Hypertension is one of the most important causes of premature death worldwide and the problem is growing; in 2025, an estimated 1.56 billion adults will be living with hypertension. Globally, nearly one billion people have high blood pressure (hypertension); which kills nearly 8 million people every year **(1).** At 2010 about one out of three U.S. adults has high blood pressure which put them at risk for heart disease and stroke (the first and third leading causes of death in the United States) while 25% of them had prehypertension. Of those with high blood pressure more than one in five (22.4%) don't know that they have it **(2)** ,and more than two-thirds of Americans who have been diagnosed with high blood pressure use medications to treat the condition **(3)** about 70% of them had their high blood pressure controlled (The control rate was 46.6%) **(2)**

.Women are about as likely as men to develop high blood pressure during their lifetimes. However, for people under 45 years old, the condition affects more men than women. For people 65 years and older, it affects more women than men[4] ,high blood pressure cost the United States $76.6 billion in health care services, medications, and missed days of work[2] .

In the South-East Asia (SEA) Region hypertension kills nearly 1.5 million people each year .Approximately one-third of the adult population in this Region has high blood pressure [1] .At 2008 the estimated prevalence of hypertensions in Saudi Arabia was 33.1% (35.2% male and 30.0% female) while in Bahrain it was 37.1% (38.3% male and 35.3% female)[5].Among adults in the United States Diabetes is the seventh leading cause of death as well as, it is leading cause of heart disease, stroke, kidney failure, non-traumatic lower limb amputations, and new cases of blindness. In 2010, 10.9 million, or 26.9% of adult USA residents aged > 65 years and 25.6 million or 11.3% of those age > 20 years had diabetes, and about 1.9 million people aged > 20 years were newly diagnosed with diabetes. In 2005–2008, 35% of U.S. adults aged 20 years or older had prediabetes (50% of adults aged > 65 years). Applying this percentage to the entire U.S. population in 2010 yields an estimated 79 million American adults aged > 20 years with prediabetes [6].Estimated diabetes costs in the United States, at 2007 was:

- Total (direct and indirect) $174 billion
- Direct medical costs $116 billion.
- Indirect costs $58 billion (disability, work loss, premature mortality) [7].

After adjusting for population age and sex differences, average medical expenditures among people with diagnosed diabetes were 2.3 times higher than what expenditures would be in the absence of diabetes. The estimated prevalence of diabetes in Saudi Arabia was 17.9% (18.1% male and 17.7% female) while in Bahrain it was 11.0 % (11.6 % male and 10.2% female) at 2008[5]. Chronic Non-communicable diseases risk factors survey in Iraq at 2006 show that the estimated prevalence of hypertension and diabetes among adult population (25-65 years) was:

- Hypertension (systolic blood pressure 140 or higher and/or Diastolic blood pressure 90 or higher) is 40.4%, being more in males, with evident rise among age group 45 years and more.
- Hyperglycemia (fasting blood glucose 7mmol/L or higher) is 10.4%, with evident rise among age group 45 years and more, in both sexes.
- One third of high blood pressure and half with diabetes are unaware of their condition [8].

Both of hypertension and diabetes represent serious problems of public health importance with significant morbidity and mortality, fortunately the natural history of both of them is well studied and either one of them have preclinical (asymptomatic) stage with availability of screening and diagnostic tools, this make both diseases suitable for screening, aiming to early detection and control of both of them.

Aim of the study:

1) To determine how often clients of Alkarkh sector are screened for hypertension& diabetes through the existing program.
2) To estimate screening efficiency based on :

- The number needed to screen to diagnose one case in the whole program and for hypertension & diabetes mellitus respectively.
- How often the program effect the prevalence of the diseases

2.Review of literatures

2-1: Hypertension:

Definitions — the following definitions have been suggested by the seventh report of the Joint National Committee (JNC 7), which were published in 2003 based upon the average of two or more properly measured readings at each of two or more visits after an initial screen, the following classification is used:

- Normal blood pressure: systolic <120 mmHg and diastolic <80 mmHg.
- Prehypertension: systolic 120-139 mmHg or diastolic 80-89 mmHg.
- Hypertension:

Stage 1: systolic 140-159 mmHg or diastolic 90-99 mmHg.
Stage 2: systolic ≥ 160 or diastolic ≥ 100 mmHg.

These definitions apply to adults on no antihypertensive medications and who are not acutely ill. If there is a disparity in category between the systolic and diastolic pressures, the higher value determines the severity of the hypertension **(9)**.

Somewhat different definitions were suggested by the European Societies of Hypertension and Cardiology, which published at 2007 guidelines for the management of arterial hypertension:

- Optimal blood pressure: systolic <120 mmHg and diastolic <80 mmHg.
- Normal: systolic 120-129 mmHg and/or diastolic 80-84 mmHg.
- High normal: systolic 130-139 mmHg and/or diastolic 85-89 mmHg.
- Hypertension:

Grade 1: systolic 140-159 mmHg and/or diastolic 90-99 mmHg.
Grade 2: systolic 160-179 mmHg and/or diastolic 100-109 mmHg.
Grade 3: systolic ≥ 180 mmHg and/or diastolic ≥ 110 mmHg **(10)**.

Diabetes mellitus

Definition*:*

The term diabetes mellitus describes several diseases of abnormal carbohydrate metabolism that are characterized by hyperglycemia. It is associated with a relative or absolute impairment in insulin secretion, along with varying degrees of peripheral resistance to the action of insulin. The diagnosis is based on one of three abnormalities:

- Fasting plasma glucose.
- Random elevated glucose with symptoms.
- Abnormal oral glucose tolerance test (OGTT).

DIAGNOSTIC CRITERIA*:*

The diagnosis of diabetes mellitus is easily established when a patient presents with:

- classic symptoms of hyperglycemia (thirst, polyuria, weight loss, visual blurring) ,and
  - fasting blood glucose concentration of 126 mg/dL (7.0 mmol/L) or higher, or
  - Random value of 200 mg/dL (11.1 mmol/L) or higher.

Confirmed on another occasion [11, 12].

WHO-criteria:

World Health Organization (WHO) established diagnostic criteria based upon an oral glucose tolerance test (OGTT). They had also suggested that a category between normality and diabetes should be used called impaired glucose tolerance (IGT) because subjects with IGT are at increased risk of developing overt diabetes and atherosclerotic vascular disease, even if they do not develop diabetes. The original WHO criteria defined diabetes as:

- Diabetes: fasting glucose ≥ 126 mg/dL (7.0 mmol/L) or a two-hour glucose ≥ 200 mg/dL (11.1 mmol/L).
- Impaired glucose test (IGT): fasting glucose <126mg/dL (7.0 mmol/L)>100mg/dL (5.6mmol/L), and a two-hour glucose ≥ 140 mg/dL (7.8 mmol/L) but <200 mg/dL (11.05 mmol/L) [13, 14].

***ADA- criteria**:*

The following definitions are from American diabetes association (ADA) reports:

- Normal: Fasting plasma glucose (FPG) <100 mg/dL (5.6 mmol/L), Two-hour glucose during OGTT <140 mg/dl (7.8 mmol/L),HbA1C <5.7%.
- Pre diabetes : Impaired fasting glucose (IFG) — Fasting plasma glucose between 100 and 125 mg/dL (5.6 to 6.9 mmol/L), Impaired glucose tolerance (IGT) — Two-hour plasma glucose value during a 75 gram oral glucose tolerance test between 140 and 199 mg/dl (7.8 to 11.0 mmol/L), HbA1C (5.7% - 6.4%).
- Diabetes mellitus — FPG at or above 126 mg/dL (7.0 mmol/L), a two-hour value in an OGTT (2-h PG) at or above 200 mg/dL (11.1 mmol/L), or a random (or "casual") plasma glucose concentration ≥ 200 mg/dL (11.1 mmol/L) in the presence of symptoms, HbA1C > 6.5%. The diagnosis of diabetes must be confirmed on a subsequent day by measuring any one of the three criteria [12, 15, and 16].

EDEG-criteria:

The European Diabetes Epidemiology Group (EDEG) recommending that the cut-off point for IFG (110 mg/dL or 6.1 mmol/L) they also recommend that the term "non-diabetic hyperglycemia" is used in preference to "impaired fasting glucose." These recommendations were based on recognition that the risk for diabetes is a continuous variable with fasting glucose levels, with no clear threshold for risk of diabetes [17].

Screening programs:

Both hypertension and diabetes represent serious problems of public health importance with significant morbidity and mortality, fortunately the natural history of both of them is well studied and either one of them have preclinical (asymptomatic) stage with availability of screening and diagnostic tools, this make both diseases suitable for screening, aiming to early detection and control of both of them.

Screening for hypertension:

There is clear evidence that treatment of high blood pressure can decrease the incidence of cardiovascular disease. Thus, the benefits of screening for, and treating, high blood pressure in adults substantially outweigh the harms [18]. The optimal interval for screening for hypertension

is not known. The 2007 United States Preventive Services Task Force (USPSTF) guidelines recommend screening every two years for persons with SBP and DBP below 120 mmHg and 80 mmHg, respectively, and yearly for persons with SBP 120 to 139 mmHg or DBP 80 to 89 mmHg [(19)] as the risk of developing hypertension in patients is not uniform, being higher in prehypertension than with normal blood pressure and in patients with other risk factors for hypertension [(20)]. Correct measurement and interpretation of the blood pressure (BP) is essential in the screening, diagnosis and management of hypertension .Many type of measurement device available ,still mercury sphygmomanometers provide the most accurate measurement of BP and epidemiologic data are based on this auscultatory methods , however proper BP machine calibration, training of personnel, positioning of patient, and selection of cuff size are all essential [(21,22)].

Screening for diabetes mellitus*:*

There are no randomized trials examining the effectiveness of screening for diabetes. Models suggest that screening for diabetes in people with elevated blood pressure may be cost-effective because of effects of blood pressure management on cardiovascular outcomes . The American Diabetes Association (ADA) recommends screening for diabetes for patients age 45 and older without risk factors. The ADA also recommends testing for diabetes in adults who are overweight or obese (BMI $\geq$ 25 kg/m^2) and has one or more additional risk factors for diabetes [(15)].The most commonly used screening tests for type 2 diabetes include measurement of the plasma glucose (FPG), two-hour plasma glucose during an oral glucose tolerance test (2-h OGTT), glycosylated hemoglobin, and the urine dipstick testing for glucose.The high rate of false-negative results suggests that the urine dipstick is not adequate as a screening test. Additionally, not all patients with glucosuria have diabetes. Glucosuria can occur with defects in renal tubular function, as seen in Type 2 (proximal) renal tubular acidosis and in familial renal glucosuria, a genetic disorder associated with salt-wasting, polyuria, and volume depletion [(23)].

Patients& methods

3-1: Design: Cross-sectional study.

3-2: Duration: From January 1st 2011 – December 31st 2011.

3-3: Setting: Al-Karkh sector for primary health care which includes 12 PHCCs, 9 of them involved in the study, these are:

1. Al-Shaljiah PHCC.
2. Al-Iskan PHCC.
3. Al-Salam (Al-tobchi) PHCC.
4. Al-Washash PHCC.
5. Al-Mansour PHCC.
6. Al-Rahmaniah PHCC.
7. Al-Karkh PHCC.
8. Al-Salihiah PHCC.
9. Al-Dakhiliah PHCC.

The remaining 3 PHCCs are excluded because 2 of them are not participating in the program, and the third one participated in the program at November 2011.

3-4: Data source:

All data base related to the program during the period of the study, kept at al-Karkh sector which conducted from the 9 PHCCs mentioned above by a special statistical form (appendix -1-) are involved in the study .The statistical form approved by the Iraqi MOH which include data collected from a 2 step screening program applied for early detection of Ht. &DM., its pilot project in selected PHCC. The action plan of which:

A- Inclusion &exclusion criteria:

- Person aged 25 years and more are involved in hypertension screening while those aged 45 years and more involved in screening for both hypertension and diabetes mellitus.
- Person who has any one of these diseases is involved in the screening of the other.
- People who have both hypertension and diabetes mellitus or gestational form of hypertension and diabetes mellitus are excluded from the program.

B-Screening methods for hypertension:

- The blood pressure should be checked by family physician or general practitioner using auscultatory method.
- Positive screening results define by systolic pressure of 140 mm Hg or more and/or diastolic pressure of 90 mmHg or more.
- Positive screening result should be evaluated one week later with patient education about life style modification if still systolic pressureof 140 mm Hg or more and/or diastolic pressure of 90 mmHg or more this considers a positive diagnostic test.

C-Screening Methods for diabetes mellitus

- Fasting plasma glucose (FPG) or Casual plasma glucose of the involved person should be measured in the primary health center lab.
- Positive screening results are defined as: Fasting plasma glucose level of 126 mg/dl or more (equal to or more than 7 mmol/L) or Casual plasma glucose level 200 mg/dl (11.1 mmol/l)or more.
- Positive screening test should be confirmed with another Fasting plasma glucose test if it 126 mg/dl or more (equal to or more than 7 mmol/L) this is considered a positive diagnostic test.

Statistical analysis:

We used the following equations:

$$1.\ \text{Coverage rate} = \frac{\text{Number screened (NS.)}}{\text{Number should be screened (NSS.)}} \times 100$$

$$2.\ \text{Number needed to screen to diagnose one case (NNS)} = \frac{\text{Number screened (NS.)}}{\text{Number of positive diagnostic tests.}}$$

$$3.\ \text{Percent of clients with positive Screening test} = \frac{\text{Number Positive screening test (+veST.)}}{\text{Number screened (NS.)}} \times 100$$

4. Percent of true positive = Screening test

$$\frac{\text{Number of positive diagnostic test (+ve DT.)}}{\text{Number of positive screening tests (+ve ST.)}} \times 100$$

5. Detection ability (DA.)= x 100

$$\frac{\text{Number of positive diagnostic tests (+ve DT.)}}{\text{Number screened (NS.)}}$$

6. Prevalence without program= (P.W.O.)

$$\frac{\text{Number of previously diagnosed cases}}{\text{Number should be screened(NSS)}} \times 100$$

7. Prevalence with program (P.W) =

$$\frac{\text{Number of previously diagnosed cases} + \text{Number of cases diagnosed by program}}{\text{Number should be screened (NSS)}} \times 100$$

8. Prevalence change=

Prevalence with program (P.W) _ Prevalence without program (P.W.O.)

9. Change percent =

$$\frac{\text{Prevalence change}}{\text{Prevalence without program (P.W.O.)}} \times 100$$

10. Ratio of cases diagnosed by the program to those diagnosed previously=

$$\frac{\text{Number of cases diagnosed by program}}{\text{Number of previously diagnosed cases}}$$

Number of cases diagnosed by program.

RESULTS

The total clients No. attended al-Karkh sector from 1st of January -31st of December 2011 was 419877, 32.29%of them aged 25 year and more, 13.67% of the later &4.41% of the total clients no. should be screened in the program, as shown in (fig.-1-) 1.8% of those excluded were previously diagnosed for both diseases, this made the prevalence of Ht. & DM. in clients should be screened in the program during period of the study 11.30%. The total no. of screening tests performed in the program during the whole period of the study was 18071, 77.74% of these screens for hypertension & 22.25% screen for DM. The total positive results were 17.35%, as shown in (fig. -2-).Of those screening for Ht. 18.42% were positive; 52.16% of the later didn't

return for 2nd diagnostic test while 10.89% diagnosed with Ht. The positive screening result for DM constitutes 13.63% of the total diabetes screening test; 16.24% of them diagnosed with diabetes & 40.87% were missed

From the total number of clients should be screened for both diseases, 94.58% of them are actually involved in the program, with coverage rate reaching 100% in some PHCCs. as shown in table -1-.The percent of clients with positive screening tests was17.87%,(14.75 for Ht.&6.99%forDM.)while the percent of clients with true positive screening tests for Ht.&DM.was10.89%,16.24%respectively,and that of the whole program was11.81%,the detection ability of the program was2.11%. it's clear from(table -3-) that the no. needed to screen to diagnose one case in the whole program was 47; while no. needed to screen to diagnose one case of Ht. was 62 & those needed to screen to diagnose one case of DM. was 88.The prevalence of both diseases in clients should be screened in the program attended al-Karkh sector during the period of the study after the screening test was increase from 11.30% to13.30%, with 2 % increase in the overall prevalence,&17.69% change percent, as shown in table -4- Most of the cases of Ht. &DM. attending al- Karkh sector during the period of the study were diagnosed outside the program with ratio reaching 5.6 cases diagnosed outside the program for 1 case diagnosed by the program as shown in table -5-.

DISCUSSION

Coverage Rate of the Screening:
The coverage rate for the screening was 94.58% in the whole sector , which is similar to that obtained by: Alexandra et al [(24)]; and Erwin et al diabetes screen study[(25)] **[**in the former study the coverage rate was 96% in a case finding program if compared with only 64% coverage rate if depending on opportunistic screening for Ht. is used while in the later study the response rate was 90% for high risk population &86% for low risk population which depend on invitation of participants in the study rather than routine screening program **]**, and disagree with that of Ma and Stafford for hypertension screening **[** in which the coverage rate was 56% **]** and this may be due to the fact that the later study depend on the measurement of rate of hypertension screening ,diagnosis rather than specific program for early detection of hypertension [(26)] .

The detection ability of the program for positive hypertension cases :
The detected cases of hypertension was 1.6% which is much lower than those obtained by: Abbas et al [(27)], Ma & Stafford[(26)] and Abbey [(28)] **[** Abbas et al for opportunistic screening for DM. found that 13.6 % of the studied sample are hypertensive **,**Ma & Stafford in show that the rate of diagnosis of hypertension was 9.2% , while Abbey noted that 5% of the patients in his sample were clinically diagnosed as hypertensive **]** , this may attributed to the fact that 52.16% of the positive screening result obtained by this study are missed &different age group are included in the compared studies.

The detection ability of the program for positive diabetes cases:
13.63% of the screened cases for diabetes were positive, which agree with that of Cristiana et al[(29)] , in this study, from the total positive screening result, only 16.24% of them were diagnosed with diabetes, which may reflect higher prevalence of diabetes in the Arabian population, the

overall detection ability for DM. was1.13% which agrees with that of Al-Baghli et al [30] and Erwin et al [25] [Al-Baghli detection ability was 1.8% & Erwin et al detection ability was 2.7% for high risk population & 0.4 % for low risk population],but it's lower than those obtained by Abbas et al [27] [which was 6.7% of the total sample & this could be caused by lower age of clients involved in the later study, and its dependence on one step screening strategy, and the fact that 40.87% of those with positive screening tests in the evaluation study was missed] ; but higher than those obtained by Goyder et al [31] [which is a pilot screening program in deprived area in England of multiple ethnicity, targeting > 40 year old with body mass index >25 person , the detection ability of which 0.22% &this may reflect the differences in prevalence of diabetes in the studied populations].

clients with positive screening test who didn't return for the second diagnostic test account for 50.19% in the whole study distributed as the following:52.16% among hypertensive positive screening tests which is higher than that of Fernández-Feijoo et al [11] & Sevek et al [32] [42.2% were missed in the former study,97.1% had their diagnostic test in the later one] , and 40.87% among diabetic positive screening tests, this in line with Al-Baghli et al [59.6% return for the confirmatory tests][30], but disagree with Erwin et al [25])&Cristiana et al[29] [86% of low risk population and 88% of high risk population return for second confirmatory test in Erwin et al study while only 37.1% return for confirmatory test with Cristiana et al], which may indicate a different follow up strategy & different response among participants in these studies.

Negative screening results*:*

Their fate remain un- clear and there's no specific guides about the interval at which they should be screened. JNC VII & 2007 (USPSTF) guidelines recommends screening every 2 years for patients with a normal blood pressure (<120/80) and annually for those found to have blood pressures in the pre-hypertensive range (120-139/80-89) [33,34]. American Diabetes Association (2000, 2005b) recommends screening for diabetes in every 2 years for those 45 year old or sooner for at risk population starting at age of 10 [35].

The number needed to screen to diagnose one case of hypertension*:*

In the program was 62 which was higher than that obtained by Sevek et al (NNS=18) [32], and this could be cause by: more inclusion criteria (younger age group, body mass index >25), use of one step screening test with higher cutoff point, using automatic blood pressure measurement in the later study & lack of follow up to those with positive screening tests in the evaluated program.

Number needed to screen to diagnose one case of DM. at al-Karkh sector was 88, which disagree with that obtained by Sevek et al [32],Goyder et al [31], Cristiana et al [29] [NNS=196 ,NNS=70, NNS=58 respectively] and this again due to the wider inclusion criteria in the later studies and the dependence on the age as a single risk factor& lack of follow up to those with positive screening tests in the evaluated program .

Number needed to screen to diagnose one case through the whole program was 47 which is lower than number needed to screen to diagnose one case of each disease alone and this agree with Sevek et al study result which stated that the number needed to screen to diagnose one case of Ht., DM., both of them was 18, 196, 15 respectively [32].

The total percent of clients with positive screening & the detection ability :of the whole program was 17.87%, 2.11% respectively which was higher than those for each disease alone, the percent of true positive screening test for the whole program was11.81% & this is higher than

those of Ht., but lower than those of DM., there's no populished study to compare these result but it's clear that using the program for both diseases gives better result than using it for each disease alone which may be important if cost effective analysis is to be applied.

The prevalence of both diseases in clients attending al-Karkh sector and should be involved in the program:without screening 11.30%which increase to 13.30% with screening program, making the change in prevalence 2% which is also considered as the prevalence of undiagnosed cases in both diseases ,so the percent of change with application of program is 17.69%,unfortunately the statistical form can't differentiate between either disease and most of the published study dealt with change in the prevalence of DM. & Ht. separately, the results agrees with that of Sevek et al **(32)[** Fernández-Feijoo found 6 of the total 18 hypertensive cases in the study discovered by screening, while Sevek et al show that 23 (2% of 1,149 subjects) subjects diagnosed with hypertension if no screening had been performed, with screening, 63 new hypertensive patients**],** and higher than that of Erwin et al**(25)** ,Goyder et al **(31)** and Janssen et al **(36) [**in these studies the prevalence of diabetes increase by 0.7%, 0.53% and 0.9% respectively **].**

The ratio of cases diagnosed previously (e.g.: outside the program in private clinic, hospital, or popular clinic) to those diagnosed by the program :

was 1:5.6, there is no published study available to compare this result. This low ratio of the program can be explained by:

- Lacking of adequate media about the program and the importance for early detection of Ht. &DM. and its rule in controlling both diseases.
- Limited services performed by PHCC (investigations & treatment).
- Limiting site of application of the program to the PHCCs while other source of diagnosis of both diseases are not involved in the screening program.

The overall low results of the program during the period of the study should be a source for program modification not a barrier for its application since a lot of studies and evidences support the continuation of the program these evidences are: Alexandra et al found that the hypertension case-finding program increased case-finding of abnormal BP levels among men aged 18 to 49 and women aged 18 to 34 **(24)**. Farshad et al recommend that primary care systems with trained community health-care workers and well established guidelines can be effective in non-communicable disease prevention and management& Iran's primary care system should expand the number and scope of its primary health-care worker programs to also address blood pressure and to improve performance in areas with few primary care personnel **(37)**, Daniel et al in his report about Rural Healthy People 2010 recommend establishing diabetes education, prevention, and detection programs to attain long-term improvement, and also recommends targeting modifiable risk factors for heart disease and stroke, in particular, high blood pressure and high cholesterol in at risk rural populations as early as age 20, using primary, secondary, and tertiary prevention strategies **(38)**, Al-Daghri et al said that aggressive promotion of public awareness, continued screening and early intervention are pivotal to boosting a positive response **(39)**, Harris et al show that the evidence for screening for DM-2 is indirect and mixed, the strongest case for screening comes from earlier detection and treatment of CVD risk factors, especially hypertension **(40)**.

One of the limitations of this study is the dependence only on the statistical form of al-Karkh sector which contain limited information about screened people, this statistical form represent the sole source of information about the program at al-Karkh sector

CONCLUSIONS

- Most of cases of hypertension and diabetes at Al-Karkh sector during the period of the study were diagnosed outside the program and about half of those involved in the program didn't return for the second diagnostic test, this make the overall results of the program low during the periods of the study.
- This low yield result should not be a barrier against program application but should be appoint for program modification since there's a lot of evidences that supports its value for better control & prevention of complications of both diseases.

RECOMMENDATIONS

More efforts should be made to improve the program to:

1. Increase no. of clients attending the PHCCs in the target age group.
2. Improve the statistical form to be more informative.
3. Expand the program to involve hospitals, private &popular clinic.
4. Improve the follow up strategy:

- To increase No. of clients with positive screening tests to had second diagnostic tests.
- To provide a guide line for those with negative screening tests about the interval they should be screened.

Ethical approval:

1-Ethical approval for the study was obtained from the scientific committee of alkindy college of medicine / university of Baghdad.

2- Ethical approval was obtained from Arabic council of medical specializations.

3- Ethical approval was obtained from iraqi ministry of health / Al-Karkh health directorate for primary health care**.**

Source of funding: ministry of health / Iraq

Conflict of interest:

Both hypertension and diabetes represent serious problems of public health importance with significant morbidity and mortality, fortunately the natural history of both of them is well studied and either one of them have preclinical (asymptomatic) stage with availability of screening and diagnostic tools, this make both diseases suitable for screening, aiming to early detection and control of both of them**.** There is clear evidence that treatment of high blood pressure can decrease the incidence of cardiovascular disease. Thus, the benefits of screening for, and treating, high blood pressure in adults substantially outweigh the harms**.**

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