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Validation of self reported diagnosis of hypertension in a cohort of university graduates in Spain

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Abstract

Background

The search for risk factors of hypertension requires the study of large populations. Sometimes, the only feasible way of studying these populations is to rely on self-reported data of the outcome. The objective of this study was to evaluate validity of self-reported diagnosis of hypertension in a cohort of university graduates in Spain.

Methods

The Seguimiento Universidad de Navarra (SUN) Study is a cohort of more than 15,000 university graduates in Spain. We selected a random s participants who reported a diagnosis of hypertension and 48 participan diagnosis (76% participation proportion). Then, we compared informatio diagnosis of hypertension and hypertension status as assessed through pressure measurements and an interview. Additionally, we compared sel

blood pressure levels with intraclass correlation coefficients and the surv

Results

From those 79 reporting a diagnosis of hypertension, 65 (82.3%, 95% C confirmed through conventional measurement of blood pressure and the that did not report a diagnosis of hypertension, 41 (85.4%, 95% CI 72.4 non hypertensives. Results were similar among men and women, but we and obese individuals, and for those with a family history of hypertensio between self-reported and measured blood pressure levels (as a continu estimated by the intraclass correlation coefficient, was 0.35 for both syst pressure.

Conclusion

Self-reported hypertension among highly educated participants in a coho valid tool to assess the hypertensive status of participants. However, th cautious when using self-reported blood pressure values.

Background

High blood pressure or hypertension (HT) is a major health problem in ou degree of awareness among the population and the difficulties to comply treatments, stress the importance of primary prevention of this disease.

The search for risk factors of incident HT requires the study of large popu only feasible way of studying these populations is to rely on self-reporte a consequence, it is of the utmost importance to assess the validity of th

The validity of the self-reported diagnosis of HT has been assessed in se including a subsample of the EPIC-Spain cohort.[3] Results vary dependi on the gold standard used (conventional measurement of blood pressure medical records).

Our objective was to assess the validity of self-reported diagnosis of HT participants in the Seguimiento Universidad de Navarra (SUN, University study, a cohort study in Spain.

Methods

The SUN Study

The SUN Study is a dynamic cohort of university graduates, recruited and mailed questionnaires. The main objective of the study was to assess th Mediterranean dietary pattern and the risk of cardiovascular disease, dia Its methods have been extensively described elsewhere.[4] Briefly, begi all graduates of the University of Navarra, Registered Nurses in Navarra, professional associations received a questionnaire and a letter of invitati objectives and design of the study. At December 2004, 17,500 had answ questionnaire, and the recruitment is permanently open. Every other yea questionnaire is mailed to each participant, gathering information about and changes in exposures of interest. The SUN Study was approved by t Board of the University of Navarra, and conforms to the principles embod Helsinki.

Questionnaires

The baseline questionnaire gathered information about sociodemographi anthropometric measures (weight, height), lifestyle factors (smoking, phy clinical variables. The participants were asked whether they had ever rec

of HT, their habitual use of medications, and their most recent BP measu
the following categories, in mm Hg: lower than 100, 101–110, 111–120,
150, 151–160, 161–175, greater than 175 for systolic BP; lower than 60
90, 91 to 100, 101 to 110, 111 to 120, 121 to 130, greater than 130 for
did not differentiate between casual BP determinations or more formal B
out according to diagnostic protocols.

The follow-up questionnaire inquired about new diagnosis of HT asking v
had been diagnosed by a physician since the last questionnaire.

Validation study

In September 2003, there were 2,929 SUN participants living in the metr
(postal codes beginning by 310). Among them, 151 referred to be hypert
results from the literature, [3,5,6] we assumed that 80% of them would
order to obtain an 8% precision in the estimates and expecting 10% of r
a random sample of 107 individuals that referred a diagnosis of HT in th
year follow-up questionnaires, residing in the metropolitan area of Pamp
did not participate in a previous study on validation of diet and physical a
Similarly, assuming that 90% of those not reporting HT would be true no
precision in the estimate and a non-response rate of 10%, we randomly
with the same inclusion/exclusion criteria than for the self-reported hype

We sent them a letter with the objectives of the validation study, an info
contact information form (e-mail address, telephone number and hours t
a postage-paid envelope. After three months, non-respondents were se
mailing if needed. Finally, we tried to contact non-respondents by phone
fifty two (response rate 90.5%) individuals accepted to participate in the
(response rate 90.7%) among the hypertensives and 55 among normote
90.2%).

After the participants gave their written consent, an appointment was m
working place, or the Check up Unit at the University Clinic for the BP me
interview was done including two BP measurements and a questionnaire
and lifestyle issues related to HT. Two medical doctors (AA, JJB) carried o
the BP measurements, from September 2003 to November 2004. At the
both study physicians were unaware of the hypertensive status of the pa
the questionnaire.

During the first minutes of the interview and with both the participant ar
down, the investigator explained the participant the objectives of the stu
the BP measurements procedure and the confidentiality of the informatio
measurement was done using an automatic BP measurement device Om
been previously validated. [7] After another five minutes, used to compl
questionnaire, the second BP measurement was done. Hypertensive pat
were not asked to stop using antihypertensive medication, because curr
antihypertensive medication was considered confirmatory of being true h

A total of 127 participants (83.6%) completed the validation protocol. Th
normotensives and 18 hypertensives) were lost either because they cha
information and could not be located, they refused to participate, failed t
with the investigator or had changed the place of residency out of the re
an appointment in Pamplona. Final participation among hypertensives ar
respectively, 78.7% and 73.8%.

Definition of self-reported HT and 'true' HT

We considered a participant had self-reported HT when s/he answered t

as hypertensive by a physician either in the basal or in the follow-up que
s/he was considered as non-hypertensive.

We considered a participant as true hypertensive when the average of b
was ≥140 mmHg for systolic BP and/or ≥ 90 mmHg for diastolic BP, wher
antihypertensive drug treatment or when s/he presented a medical repo
[8]

Statistical analysis

We computed the proportion of confirmed cases of HT as the number of
diagnosis of HT and had HT according to our gold standard, divided by al
diagnosis of HT. Similarly, we computed the proportion of confirmed non
number of those who did not report a diagnosis of HT and were non hyp
our gold standard, divided by the total number of individuals non reporti
studied agreement between self-reported and measured BP using a ran
intraclass correlation coefficient [9] and the survival-agreement plot prop
the survival-agreement plot, the absolute difference X_i between BP meas
axis against the proportion of pair of observations with an absolute diffe
X_i using the Kaplan-Meier method.[10] We also used the modification pr
Delgado to detect bias in any of the measurement methods.[11] Accordi
modification, we separated those observations with self-reported BP hig
and those with measured BP higher than self-reported BP. Then, we com
differences both groups using the log-rank test.

To compute the sensitivity and the specificity of the self-reported diagnos
the expected distribution of true and false positives and negatives in the
based on the sampling fractions and the observed percentages of confir
computed the kappa coefficient and the true prevalence of HT in that pop
interval (CI) for the prevalence of HT was estimated as suggested by Co
sampling.[12]

Results

We included 70 men and 57 women in our analyses. Mean age was 53 a
HT and 37 among those not reporting a HT diagnosis (range 22–83 and
total of 60 (47.3%) had a BMI ≥ 25 kg/m^2. Table 1 shows the main chara
participants.

Table 1. Characteristics of participants in the validation study by self-repo
status.

We confirmed 65 (82.3%) of the 79 self-reported HT cases (95% CI 72.8
participants who did not report a HT diagnosis in the questionnaires, 41
89.1%) could be considered normotensives according to our gold standa
group, when the cut-off point for HT was 160/95 instead of 140/90, the p
normotensives increased to 97.9% (95% CI 88.7% to 100%).

Table 2. Hypertension status and validity of self-reported hypertension ac
relevant variables

There were no antihypertensive drug users among those reporting no hy
those reporting a diagnosis of hypertension (36 out of 79) were taking a
the time of the interview. Among the remaining 43, only 14 (33%) had th
under 140/90 and were not receiving drug treatment for hypertension.

The proportion of confirmed hypertensives was higher among those grou
higher prevalence of HT (men, older people, and those with high BMI or w
The proportion of confirmed normotensives followed an inverse pattern (

Taking into account our sampling fractions and assuming our estimate fo
confirmed hypertensives, we expected that 124 out of the 151 individual
diagnosis of HT in the source population were true hypertensives (true p
normotensives (false positives).

Likewise, the number of true normotensives (true negatives) in the sour
2373 (from 2778 self-reported normotensives) and 405 would be hypert
Based on these assumptions, the values for sensitivity, specificity and ka
0.23, 0.99, and 0.31, respectively. The prevalence of HT in this populatio

In spite of the categorization used to collect self-reported data about BP
calculated the intraclass correlation coefficient and its 95% CI to assess
between self-reported BP and directly measured BP as a continuous vari
the correlation between self-reported and directly observed information
systolic and diastolic BP and higher for men than women.

Table 3. Intraclass correlation coefficients (95% CI) between self-reporte
Pressure* and directly measured blood pressure §

Finally, we used the survival-agreement plot to depict graphically the ag
reported and BP measurements (Figure 1). Using the modification of this
Llorca and Delgado to detect bias, we noted that measured systolic BP t
self-reported systolic BP (log-rank test, p = 0.0005). However, this bias
diastolic BP (log-rank test, p = 1.00).

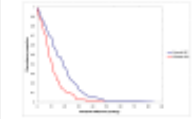

Figure 1. Survival-agreement plot, as proposed by Luiz
The x-axis shows the absolute difference between self-r
measured blood pressure (BP), and the y-axis shows th
of observations with differences that are at least the obs
difference. Separate lines for systolic and diastolic BP.

Discussion

Our findings showed an acceptable degree of confirmation of self-reporte
the overall agreement was not very high. Particularly, our assumptions f
taking into account the sampling fractions, the sensitivity and the kappa
the other side, specificity was excellent. Although these results may see
consider that the use of self-reported diagnoses with low sensitivity but
cohort study do not represent a substantial drawback, because it is very
chronic diseases, will end eventually showing themselves up during the f
Then, in this particular setting, it would be more important to retain a hig
in the long-term new cases of HT will eventually be diagnosed. In additio
forget that all except one of our false negative cases disappeared when
was 160/95 instead of 140/90 mmHg, and that there were no individuals
medication among those reporting normal blood pressure.

Several studies with different methodology have evaluated the validity o
of HT. For example, in the EPIC-Murcia cohort, the kappa coefficient betw
medical record-based diagnosis of HT was 0.58, but the investigators dic
the BP of participants, as we did, because their gold standard were only
the South Carolina Cardiovascular Disease Prevention Project, the sensit
positive and negative predictive values were, respectively, 79, 91, 76 an

and 62, 91, 75, and 85 for white men, with no differences between over
subjects.[13] In a sample of Finnish individuals, self-reported HT was con
records, obtaining similar results.[6] In the National Health and Nutritiona
the sensitivity for the self-reported diagnosis of HT was 71% and the spe
studies have found similar results. [15-18] Finally, in the Nurses' Health
Professional Follow-up Study, with a design similar to the SUN Study, the
rates among true HT diagnosis and self-reported cases of HT were comp

Our study has several drawbacks. First, the number of study subjects wa
thus, validity estimations had wide confidence intervals. Particularly, the
different subgroups should be interpreted cautiously. Second, our 'gold s
measurements, has a limited validity. Actually, HT diagnosis should be ba
measurements, taken on separate occasions. [8,20] Third, our study des
direct computation of confidence intervals for sensitivity, specificity and t
other side, the high educational level of our study participants ensures t
and, consequently, HT diagnosis are not influenced by educational status
physicians that performed the BP measurements were unaware of the q
making both assessments of HT diagnosis completely independent, a cor
validation studies.

The observed agreement between observed and self-reported values of
as expressed by the intraclass correlation coefficient and the survival-ag
high. However, BP levels have a high within-person variability and, in fac
track in a population (tracking being defined as the stability of a certain
predictability of later values from earlier measurements).[21] In fact, sys
tended to be higher than self-reported BP in our population, probably du
levels over time and also due to a possible white-coat effect.[22]

Finally, we acknowledge that some misclassification will always exist in t
of HT. But, on the other side, the study of large populations would be un
rely on conventional measurements, given the high amount of resources
accurate diagnosis of HT. The trade-off between precision and sample si

Conclusion

In conclusion, self-reported HT diagnosis in the SUN Study participants s
to be used in this large cohort study. However, our results do not suppo
BP levels (i.e. a continuous variable) as a valid measurement of usual BP

List of abbreviations

BP: blood pressure

CI: confidence interval

HT: hypertension

SUN: Seguimiento Universidad de Navarra, University of Navarra Follow-

Competing interests

The author(s) declare that they have no competing interests.

Authors' contributions

AA participated in the study design, the acquisition of data, the study an
drafting of the manuscript. JJB participated in the acquisition of data and
results. MDR participated in the study design and in the interpretation of
statistical expertise. MAM have made substantial contributions to concep

study, participated in the statistical analysis and the interpretation of da
have revised the manuscript for important intellectual content and read
manuscript.

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