Association between alcohol and crack: Prevalence, effects, associated factors and experiences of combined use

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 Objective
To estimate the prevalence and factors associated with the effect of alcohol on crack cocaine use and to analyze experiences related to combined use. Materials and methods: sequential mixed methods (qualitative and quantitative) research, carried out between August 2014 and August 2015 with people who use crack. In the quantitative approach, a cross-sectional study was conducted with 1,062 participants. Factors associated with “alcohol use with the effect of increasing the effect of crack/crack craving” were estimated by multiple regression. In the qualitative approach, 39 interviews were conducted using Bardin’s content analysis technique.

Results
871 (82.0%) participants reported consuming alcohol, among them, 668 (76.7%) used alcohol combined with crack: 219 (32.8%) reported feeling an effect of reduction in paranoia and/or crack craving and 384 (57.5%) reported feeling an increase in the effect of crack and in the craving to consume the drug. This relationship was also observed in the narratives of the people who use crack, with the possibility of a cyclic effect of consumption of the two substances. Those who related alcohol use to the effect of increasing crack craving (384) were more likely to use alcohol before crack (OR: 1.81; 95%CI: 1.13–2.89); to consume more than 20 stones daily (OR: 1.48; 95%CI: 1.01–2.16); to remain in abstinence from crack for less than one month (OR: 3.20; 95%CI: 1.91–5.35); to use dependence treatment services (OR: 1.85; 95%CI: 1.26–2.71); and to commit physical violence (OR: 1.67; 95% CI: 1.08–2.56).
Conclusion

The findings of this study indicate that the modulation of the effect of alcohol use on crack cocaine depends on the moment when the drugs are consumed, and the use of alcohol before crack consumption is associated with characteristics that suggest a greater vulnerability to patterns of harmful crack use. Even though combined use is referred to as a way of reducing the negative effects of crack, the damage of this association may be greater than its possible benefits.

Introduction

Alcohol is a psychoactive substance that is not usually perceived as a drug due to its sociocultural acceptability and outstanding position in the global market. However, excessive alcohol consumption has become one of the main problems of contemporary societies, mainly due to negative consequences to health and quality of life. Therefore, it is considered an important public health problem [1].

The Global Status Report on Alcohol and Health estimates that 237 million men and 46 million women suffer from disorders related to alcohol abuse. According to the report, in 2016, harmful use of alcohol resulted in 5.3% of all deaths and represented 5.1% of the global burden of diseases and injuries. It is a causal factor for more than 200 health problems, including injuries caused by accidents and violence, suicide, mental and behavioral disorders, non-communicable diseases and infectious diseases, like tuberculosis and HIV/AIDS [2].

In Brazil, it is estimated that 66.4% of the population has consumed alcohol at some point in life and 30.1% consumed it in the last 30 days. This proportion is higher among men (38.8%) compared to women (21.9%) [3]. Among people who use crack cocaine, a prevalence of approximately 70% of alcohol consumption in the last 30 days has been found [4–7].

Combined use of alcohol and crack is a frequent practice in drug abuse scenarios and different functions and effects have been reported regarding this association: as a strategy to reduce paranoia, anxiety and fear, and also as something that “triggers” the onset of use of these substances, that is, it increases the desire to consume them [8–10]. Combined use can also be a strategy to potentiate the effect of crack, as the pharmacodynamic interaction between alcohol and cocaine significantly increases the systemic bioavailability of cocaine, producing higher chemical responses such as intense and long-lasting euphoria [8, 9, 11–13].

Combined use of alcohol and cocaine is also associated with greater vulnerability to HIV infection [14], greater facility to develop multiple and cross dependence, difficulty in adhering to and maintaining therapy [15, 16], difficulty in social reintegration, and with a higher number of episodes of criminal justice involvement, violence and imprisonment [17, 18]. Studies that enhance our understanding of crack and alcohol co-use can inform the design of tailored intervention approaches that reflect the lived experiences of people who use.

The ethnic, cultural, economic and social differences that divide Brazil in five distinct regions led the authors to develop the study in the Northeast, the region that presents the highest percentage of the population that uses crack regularly [6]. Pernambuco, the Northeastern state where the study was carried out, concentrates municipalities with significant numbers of people who use crack, and presents peculiarities in the culture of crack use, like consumption places and their dynamics [19], as well as forms to prepare the drug for consumption [20, 21]. For a comprehensive understanding, we used the mixed methods approach [22], which was employed with the purpose of obtaining data that complement each other and enable consistent and in-
depth results on the subject investigated. In this perspective, the aim of this study was to estimate the prevalence and factors associated with the effect of alcohol use on crack use, and to analyze experiences related to the combined use of these substances in the Northeast region of Brazil, in four municipalities of the state of Pernambuco, including the state capital, Recife.

**Materials and methods**

This study is part of the research "Vulnerability of crack cocaine users to HIV and other communicable diseases: a socio-behavioral and prevalence study in the state of Pernambuco", funded by the Health Surveillance Department of the Ministry of Health (Notice 20/2013) [7] and approved by the research ethics committees of Fundação Oswaldo Cruz Pernambuco (CAAE-25250413.6.0000.5190) and Universidade Federal de São Paulo [23] (CAAE-33243514.3.0000.5505). We employed the sequential mixed methods approach (qualitative and quantitative). Initially, quantitative data were collected and analyzed; subsequently, the stage of the qualitative approach was developed [22]. The final interpretation was performed in an integrated way, through convergence of numerical data with the detail and depth of qualitative data, which enabled us to be closer to the studied reality and to better understand the investigated problem [22, 24].

In the quantitative approach, a cross-sectional epidemiological study was carried out in a representative sample of people who use crack assisted by a program called Attitude (Attitude)—Comprehensive Care Program for Drug Users and their Families -, a public social protection service that aims to respond to the vulnerability situation associated with drug use. The Program is recognized for the excellence of the care it provides for people who use crack and other drugs [25, 26], prioritizing individuals who are in a situation of exposure to violence, face risk of death due to drug trafficking, and whose family bonds are weakened [27].

The sample was calculated based on the number of men (n = 1,594) and women (n = 355) assisted by the Attitude Program in 2013 and on HIV prevalence, totaling 766 men and 238 women [7]. The inclusion criteria were: being 18 years of age or older, using crack cocaine regularly (at least 25 days in the six previous months) [28], and not being in acute intoxication due to drug use.

Data collection was conducted between August 2014 and August 2015 in the four centers of the Attitude Program located in the cities of Recife, Jaboatão dos Guararapes, Cabo de Santo Agostinho and Caruaru. The sample was distributed among the centers proportionally to the number of men and women assisted in each of them in the year before data collection. A pilot study was carried out to test the procedures of the quantitative and qualitative stages.

People who use crack were invited to participate in the study during visits to the facilities of the Attitude Program centers. A consent document known as TCLE (Termo de Consentimento Livre e Esclarecido) was read to them and the objectives, procedures, risks and benefits were duly clarified. After the subjects signed the TCLE, a socio-behavioral questionnaire (S1 Appendix) was administered to them, containing questions about sociodemographic characteristics, drug use, access to health services, HIV infection, sex life, violence, and criminal justice involvement.

For data analysis, initially the frequency distribution of the main characteristics of the study population was calculated, according to the type of effect of alcohol use on crack use (increase in the effect of crack/crack craving; reduction in crack paranoia/craving), utilizing Pearson’s chi-squared test. Subsequently, “alcohol use with the effect of increasing the effect of crack/crack craving” was considered the outcome variable and its crude and adjusted associations with the questionnaire variables were analyzed by means of simple and multiple regression, respectively, using the backward selection procedure. The statistically significant variables in
the bivariate analysis (p ≤ 0.20) were included in the initial, non-adjusted model, and the variables with p<0.05 were maintained in the final model. To quantify the strength of the association between the outcome variable and the independent variables, Odds Ratio (OR) values were calculated, as well as their respective confidence intervals (CI). The analyses were performed with the help of the software "Statistical Package for the Social Sciences"–SPSS, version 20.

In the second stage, the qualitative approach was employed to enhance our understanding of the social dynamics [29] related to the culture of crack use. The participants of the qualitative sample were recruited among those who had participated in the quantitative stage. Therefore, they met the inclusion criteria defined for that stage and another criterion necessary for the qualitative research: having a comprehensible speech. The technical team of the Attitude Program played the role of gatekeeper–facilitator of access to the study participants [30]–and selected, among those who used crack and participated in the quantitative stage, the ones who had a comprehensible speech.

The research objectives were explained to the selected participants and those who agreed to participate were referred to the researchers. After the TCLE was read to them, they were submitted to a semi-structured interview, whose questions were based on a script with topics previously prepared by the researchers (S2 Appendix). The script was based on the literature about the culture of crack use and addressed different themes.

Sample size was defined by theoretical saturation. This is a point defined as the interruption in the inclusion of new participants in the sample because the obtained data start presenting, according to the researcher’s appraisal, a certain redundancy or repetition; thus, the researcher believes it is not relevant to continue with data collection [31]. The point of theoretical saturation was achieved with 39 participants.

One of the researchers conducted all the interviews and one single professional was responsible for all the transcriptions, to avoid variations in the form of conduction and register, thus reducing possible biases in the analysis process. The interviewer has extensive experience of qualitative interviews and, additionally, she knew the population that is the object of this study, which contributed to establish the bond of trust between interviewee and interviewer, fundamental to the quality of a qualitative interview. Concerning data validation, the transcribed material was fully compared with the original audio version. To guarantee the participants’ anonymity, they were identified by names of precious stones in the presentation of their narratives.

In the analysis of the interviews, we used the content analysis technique, which was carried out through the analysis by thematic categories, based on the definitions proposed by Bardin [32]. The three recommended stages were performed: pre-analysis, exploration of the material and treatment of the results. The interviews were divided and the answers of all the interviewees to the same question were grouped. The thematic axes were identified and, at this point, with the aid of the software NVivo 10, the units of meanings that were important for each thematic axis were coded. These units were grouped by similarity, originating categories. This process was repeated more than once to refine the categories. The process of coding and formation of categories was developed by two other researchers (triangulation of researchers), ensuring data reliability and validity. The triangulation of methods (mixed methods) also contributed to data reliability and validity.

For the present study, “association of crack with other substances” was identified as the thematic axis, and the contents referring to the following categories of analysis are presented: “alcohol use to reduce paranoia and/or crack craving”; “alcohol use to “trigger” crack consumption”; “vicious circle of alcohol and crack consumption”.

As the phenomena most highlighted by the participants were paranoia and craving, it is important to explain their meaning. These phenomena are among the most evident symptoms
related to crack cocaine consumption. Craving is characterized by an intense desire to consume the drug. It is considered a critical factor for the development of compulsive use and drug dependence, and for relapses after a period of abstinence [33]. Paranoia is the most severe psychiatric symptom among those produced by crack and is identified by paranoid states and persecutory delusions accompanied by olfactory, visual and auditory hallucinations. Both effects tend to worsen over time due to the sensitivity that the person who uses crack develops to these symptoms [34].

Results and discussion

In the quantitative stage, 1,062 people were interviewed, a surplus of 58 participants in relation to the sample that had been initially calculated, in order to accommodate the demand of the people assisted by the Atitude Program. Of the 1,062 interviewees (819 men and 243 women), 871 (82.0%) reported consuming alcoholic drinks, and this proportion is higher among men (84.3%) compared to women (74.1%) (p = 0.02). Among those who consume alcohol, 668 (76.7%) reported using it associated with crack. Of them, the 219 individuals (32.8%) who stated feeling an effect of reduction in paranoia and/or in crack craving, and also the 384 individuals (57.5%) who reported feeling an effect of increase in the craving to consume the drug composed the sample for analysis, totaling 603 participants. A total of 40 (6.0%) participants who mentioned that alcohol has no effect on crack use were not included, nor were 25 (3.7%) participants who stated that alcohol use had the two effects described above or mentioned others, like avoiding the “dry mouth” effect or using crack to “make the cachaca (distilled alcoholic beverage made from fermented sugarcane juice, very popular in Brazil) come down”, that is, to reduce the effects of drunkenness.

The sociodemographic profile of the participants who reported that alcohol use increases the effect of crack craving (n = 384) was similar to the profile of those who reported that alcohol reduces paranoia and crack craving (n = 219). In both groups, the major part were men (78.8%) aged 25 years or older (71.0%; mean 29.3, median 27.0, SD 8.0), with brown skin color (65.0%), single/separated/widowed (82.1%), with less than eight years of schooling (71.0%), living on the streets, in shelters run by the government, hospitals, dependence treatment services or in prison on the 30 previous days (62.5%), with income lower than one minimum salary (52.4%; mean R$ 1,508.9; median R$ 700.0; SD R$ 6,403.2) (Table 1). This profile is similar to the one found in a national survey on crack cocaine use [6]; however, the frequency of individuals with no fixed address and who live alone is higher in our study, which highlights the high social vulnerability of the people who use crack assisted by the Atitude Program.

Early onset of alcohol use (before 13 years of age) was reported by 174 (28.9%) participants (Table 2) and, among them, 31 (17.9%) also reported early onset of crack use (non-tabulated data). The mean age at onset of alcohol use was 14.0 years (median 14.0, SD 3.0), while the mean age at onset of crack use was 19.8 years (median 18.0, SD 7.3) (non-tabulated data). On the 30 previous days, 317 (59.4%) people who use crack reported having used crack on a daily basis, while 191 (36.5%) reported having used alcohol every day in the same period (Table 2). Among those who reported using crack daily, 66.8% also used alcohol everyday (non-tabulated data). The average number of stones consumed per day was 10.5 (median 2.0, SD 26.5) (non-tabulated data).

The results of the quantitative stage show the association of crack with alcohol depends on the moment in which the latter is consumed. Those who use alcohol after crack reported, more frequently, an effect of reduction in crack craving, while the use of alcohol before crack was associated with an increase in the effect of crack/crack craving, with a statistically significant difference (p-value <0.001) between the moment of alcohol use and the effect caused (Table 2)
The results obtained in the qualitative stage reinforce and deepen the findings of the quantitative research, that is, the effects of the association between crack and alcohol were related to the moment in which the person who uses crack consumes alcohol. In the narratives produced through the qualitative interviews, the participants reported that using alcohol after crack had a “calmative” function, tranquilizing or reducing the negative effects experienced with the use of crack. On the other hand, when they consume alcohol before crack, they reported the “triggering” function, that is, alcohol triggers the desire to use crack.

The narratives below refer to alcohol, consumed after crack, as an agent that reduces the paranoia symptoms caused by crack.

Alcohol use to reduce paranoia and/or crack craving

Table 1. Socio-demographic characteristics of people who use crack that reported some effect of alcohol on crack craving, assisted in the Attitude Program, Pernambuco, August 2014 to August 2015.

| Variables                         | Reduction (n = 219) | Increase (n = 384) | χ² | P-value | Total (N = 603) |
|-----------------------------------|--------------------|--------------------|----|---------|----------------|
|                                   | n  | %    | n  | %    |               |
| Sex                               |    |      |    |      | 3.107 0.07    | 475 78.8 |
| Male                              | 164| 74.9 | 311| 81.0 |                 |
| Female                            | 55 | 25.1 | 73 | 19.0 |                 |
| Age group (years)                 |    |      |    |      | 0.440 0.50     | 175 29.0 |
| 18 to 24                          | 60 | 27.4 | 115| 29.9 |                 |
| 25 or older                       | 159| 72.6 | 269| 70.1 |                 |
| Skin color                        |    |      |    |      | 1.679 0.64     | 392 65.0 |
| White                             | 38 | 17.4 | 61 | 15.9 |                 |
| Black                             | 31 | 14.2 | 66 | 17.2 |                 |
| Brown                             | 143| 65.3 | 249| 64.8 |                 |
| Others (yellow and indigenous)    | 07 | 3.2  | 08 | 2.1  |                 |
| Marital status                    |    |      |    |      | 0.154 0.69     | 495 82.1 |
| Single, separated or widowed      | 178| 81.3 | 317| 82.6 |                 |
| Married or lives with partner     | 41 | 18.7 | 67 | 17.4 |                 |
| Considers him/herself religious   |    |      |    |      | 2.476 0.11     | 463 76.8 |
| Yes                               | 176| 80.4 | 287| 74.7 |                 |
| No                                | 43 | 19.6 | 97 | 25.3 |                 |
| Level of schooling (in years)     |    |      |    |      | 1.177 0.27     | 429 71.1 |
| < 8 (never went to school to incomplete junior high school) | 150| 68.5 | 279| 72.7 |                 |
| ≥ 8 (complete junior high school to complete higher education) | 69 | 31.5 | 105| 27.3 |                 |
| Place where lived/slept in the 30 previous days |    |      |    |      | 0.136 0.71     | 233 38.1 |
| No fixed address and others a     | 137| 63.4 | 234| 61.9 |                 |
| Lives in his/her own house, in partner’s, friends’ or in a rented house | 79 | 36.6 | 144| 38.1 |                 |
| Current work situation            |    |      |    |      | 3.578 0.06     | 259 44.0 |
| Does not work                     | 84 | 38.9 | 175| 46.9 |                 |
| Works (formally or informally)    | 132| 61.1 | 198| 53.1 |                 |
| Individual monthly income         |    |      |    |      | 31.01 0.08     | 316 52.4 |
| < 1 minimum salary b              | 125| 57.1 | 191| 49.7 |                 |
| ≥ 1 minimum salary                | 94 | 42.9 | 193| 50.3 |                 |

a Living on the streets, in shelters run by the government, hospitals, treatment services or in prison on the 30 previous days.

b In 2014, the minimum salary corresponded to R$ 724.00.

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I started using alcohol, too, because of crack use. When crack ends in a moment I need to use something, I run to alcoholic drinks, I run to pills, I run to lolo (clandestine preparation made of chloroform and ether; different compositions can be found, used only for abuse purposes), to other kinds of drug (…). Alcohol reduces more the effect of crack, it prevents the
effect of crack from exploding, then it doesn’t cause that paranoia in which I run back and forth, trying to see things (Agate).

Cachaça calms me down, makes me go back to my normal state, there’s no alteration, there is no bug. I smoke a joint, I have one drink and everything’s fine, you know? (Amethyst).

Alcohol stops that sensation of looking one way and the other. (... that there are people looking, staring, there are people behind you (...). When we’re smoking crack and the effect fades quickly, we drink alcohol and it turns us on immediately. (...) we feel happy, we smile, we play, we dance, we have fun. Crack doesn’t do this. It causes frustration. I started to smoke crack before I consumed alcohol, then I realized that when I start drinking, that frustration goes away (Alexandrite).

Ribeiro, Sanchez and Nappo [35] also reported on the effect of alcohol as a substance capable of reducing the transitory paranoia effects and mitigating fear and anxiety. In addition, they found it is capable of serving as a “calmative” for the craving effect, reducing the need to use more crack.

In addition to the tranquilizing effect, in the reports below we see that alcohol helps to mask the appearance of the person under the effect of crack—sensation of fear, wide eyes and frightened appearance.

Alcohol reduces more the effect of crack, it makes you happier and prevents hallucinations, of things, of bad things. You become happier and you don’t stay there, interned [the term “interned” is used to refer to the situation where a person stays at a place for a very long time, using crack continuously]. When you use only crack, you just want to stay there. I’m so ashamed of people, because I’m under the effect of crack and I think it’s a very frightful scene (Gold).

Crack makes us nervous, anxious, scared; alcohol doesn’t; it relaxes us, it makes us calm, it removes the intensity of crack. Now, if you’re using just crack, you get frightened, you walk looking one way and the other. I think that, when you use alcohol, you reduce that intensity you have in the use of pure crack. That’s why I use both (Coral).

On the other hand, alcohol consumption before crack use appears to have a “triggering” effect, stimulating the use of crack. In the experience of some people who use crack, consuming alcohol means using crack right after it, as Ribeiro, Sanchez and Nappo [35] and Leite, Oliveira and Cruz [36] found in the studies they developed.

The narratives below reveal the desire of using crack after alcohol consumption.

Alcohol use to “trigger” crack consumption

To sleep on the street, you must drink and I can’t drink; when I drink, I get crazy, I have serious problems with alcohol. If I drink, oh my God, while I don’t drink I don’t use drugs, and to sleep on the street, you must get drunk, sober people don’t sleep on the street. Because if you die, you sleep and don’t feel (...). I only use it after I drink, when I’m sober I don’t feel like using it (Aquamarine).

If I drink, I have to smoke crack; if I’m drinking today, you can say to me: today you’ll smoke crack. Because alcohol calls for crack, in me it causes an immense desire to smoke (Lapis lazuli).
What Aquamarine reported bolsters what was obtained in the quantitative stage, through which it was possible to observe a greater proportion of daily use of alcohol among individuals who had spent the 30 previous days living on the streets (74.1%) when compared to those who lived in rental housing or had their own home (25.9%) (p-value < 0.001) (non-tabulated data). Desire for alcohol can emerge in response to constant stressful situations [37], as it is the case of homeless people. These findings reveal that daily use of alcohol is a characteristic related to social marginalization, aggravated by its “triggering” effect for crack cocaine consumption. Thus, life conditions, including the physical and social environment, play a fundamental role in the profile of drug use [38].

To some participants, alcohol use has both effects—it increases the desire for crack (increases craving) and prolongs the pleasant effect (reduces craving) of crack. When using alcohol, these interviewees feel the need to use crack and, subsequently, due to the negative and paranoid effects of crack, they use alcohol again to feel better. This vicious circle of alcohol and crack consumption can last several days, causing greater consumption of both substances, contributing to a neuroadaptation of the dopaminergic system [39], and, consequently, to alcohol tolerance and dependence [40].

Vicious circle of alcohol and crack consumption

You take two, three drinks of cachaca and it reduces the adrenaline, the sensation of fear. It is the cachaca that reduces the effect. Alcohol comes after the crack, but sometimes, I drink cachaca before, then the desire hits me and I smoke crack. Then, when I smoke it, I drink cachaca and it reduces the effect (Garnet).

It tranquilizes me, I don’t get paranoid (…) you become softer (…) after smoking I need to drink (…) if I drink first, I smoke, or if I smoke first, I have to drink (Aventurine).

In the present study, intense use, monthly frequency and the form in which participants evaluate crack consumption were not different between the individuals who reported that alcohol has the effect of reducing crack craving and those who reported that alcohol has the effect of increasing crack craving. However, we noticed that the group that reported alcohol use to increase the effect of crack craving, when compared to the group that reported using it to reduce paranoia and/or craving, presented a higher frequency of daily consumption of more than 20 stones; of involvement in drug trafficking to obtain crack cocaine; and of a period of abstinence from crack use lower than 30 days. All these differences are statistically significant (Table 2).

No statistically significant differences were found between the two above-mentioned groups concerning use of condoms in the last sexual relationship and self-perception of the likelihood of being infected with HIV. However, the people who reported that alcohol has the effect of increasing crack craving, when compared to those who reported that it reduces paranoia and/or craving, presented a higher frequency of access to dependence treatment services and of practice of drug-related physical violence with the use of guns or cold weapons at some point in life. These differences are statistically significant (Table 3).

To assess the influence of different aspects of vulnerability on the occurrence of alcohol use with the effect of increasing crack craving, a multivariate logistic regression was performed. Initially, the factors that were associated (p-value ≤ 0.20) with alcohol use with the effect of increasing crack craving were included, except the variable “current work situation”, because it associates strongly with “individual monthly income”. Based on the variables that remained in the final model (p-value < 0.05), we found that the individuals who reported that alcohol use increased crack craving were more likely to use alcohol before crack (OR: 1.81; 95%CI: 1.13–
Table 3. Characteristics of the utilization of health and treatment services, sexual behavior, self-perception of the likelihood of being infected with HIV, violence and criminality among people who use crack assisted in the Attitude Program, Pernambuco, August 2014 to August 2015.

| Alcohol effect on crack craving | Reduction (n = 219) | Increase (n = 384) | \( \chi^2 \) | P-value | Total (N = 603) |
|--------------------------------|--------------------|-------------------|------------|---------|----------------|
|                                | n      | %    | n      | %    | n      | %    |
| Used health services in the 12 previous months | 2,346  | 0.12 | 365    | 60.6  | 365    | 60.6  |
| Yes                            | 144    | 64.7 | 224    | 58.3  | 365    | 60.6  |
| No                             | 77     | 35.3 | 160    | 41.7  | 237    | 39.4  |
| Used services to treat dependence on alcohol, crack or other drug in the 12 previous months | 9.123  | <0.01| 279    | 46.4  | 322    | 53.6  |
| Yes                            | 83     | 38.2 | 196    | 51.0  | 279    | 46.4  |
| No                             | 134    | 61.8 | 188    | 49.0  | 322    | 53.6  |
| Use of condom in the last sexual relationship | 2.28   | 0.13 | 238    | 40.1  | 356    | 59.9  |
| Yes                            | 94     | 44.1 | 144    | 37.8  | 238    | 40.1  |
| No                             | 119    | 55.9 | 237    | 62.2  | 356    | 59.9  |
| Self-perception of the likelihood of being infected with HIV | 5.022  | 0.08 | 356    | 59.9  | 356    | 59.9  |
| None                           | 67     | 31.6 | 153    | 40.2  | 220    | 37.1  |
| Low                            | 104    | 49.1 | 154    | 40.4  | 258    | 43.5  |
| High                           | 41     | 19.3 | 74     | 19.4  | 115    | 19.4  |
| Result of the last HIV test (self-stated) | 0.000  | 1.00 | 20     | 5.0   | 380    | 95.0  |
| Positive                       | 08     | 5.0  | 12     | 5.0   | 20     | 5.0   |
| Negative                       | 152    | 95.0 | 228    | 95.0  | 380    | 95.0  |
| Committed physical violence at some point in life and it was related to drug use\(^a\) | 5.04   | 0.02 | 302    | 50.5  | 302    | 50.5  |
| Yes                            | 51     | 23.4 | 123    | 32.0  | 174    | 28.9  |
| No                             | 167    | 76.6 | 261    | 68.0  | 428    | 71.1  |
| Was arrested at some point in life | 2.134  | 0.14 | 302    | 50.5  | 302    | 50.5  |
| Yes                            | 101    | 46.5 | 201    | 52.8  | 302    | 50.5  |
| No                             | 116    | 53.5 | 180    | 47.2  | 296    | 49.5  |

\(^a\) Any kind of physical violence committed with guns or cold weapons (revolver, knife, stiletto, glass shard or other sharp objects) was considered.

2.89); to consume more than 20 stones daily (OR: 1.48; 95%CI: 1.01–2.16); to remain in abstinence from crack for less than one month (OR: 3.20; 95%CI: 1.91–5.35); to use dependence treatment services (OR: 1.85; 95%CI: 1.26–2.71); and to commit physical violence (OR: 1.67; 95%CI: 1.08–2.56). On the other hand, those who consumed alcohol after crack were less likely to report the increase in crack craving (OR: 0.31; 95%CI: 0.19–0.50) (Table 4). The result of the Lemeshow test showed that the data adjusted adequately to the model (p = 0.396), which could explain correctly 70.2% of the cases.

The quantitative results are aligned with the interviewees’ discourses, showing that the moment of alcohol use, with regards to the moment of crack use, appears to play a significant role in the subjective and behavioral effects of crack. Although the use of alcohol after crack was related to a reduction in paranoia and craving, this strategy, identified by people who use crack as a way of diminishing the negative effects of crack (as it has been observed also with the use of marijuana [14, 35, 41], may stimulate a desire for crack, therefore inciting crack craving. Thus, alcohol might induce a vicious consumption circle of the two substances, contributing to a greater risk of alcohol and crack dependence [42], overdose [43], and other health damages caused by the use of crack cocaine [44].

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Table 4. Odds Ratio and confidence interval for alcohol use with the effect of potentiating crack craving among people who use crack assisted in the Attitude Program, Pernambuco, August 2014 to August 2015, according to the multivariate regression model.

| Variables                                              | Univariate Regression | Multivariate          |
|--------------------------------------------------------|-----------------------|-----------------------|
|                                                        | OR (95%CI) | P-value | OR (95%CI) | P-value |
| Main exposure variable                                 |            |         |            |         |
| Number of consumed stones                               |            |         |            |         |
| Up to 20 stones                                        | 1.48 (1.05–2.07) | 0.02    | 1.48 (1.01–2.16) | 0.04 |
| ≥ 21 stones                                             | - | | - | |
| Co-variables                                           |            |         |            |         |
| Sex                                                    |            |         |            |         |
| Male                                                   | 1.42 (0.96–2.12) | 0.07    | - | |
| Female                                                 | - | | - | |
| Considers him/herself religious                        |            |         |            |         |
| Yes                                                    | - | | - | |
| No                                                     | 1.38 (0.92–2.07) | 0.11    | - | |
| Individual monthly income                              |            |         |            |         |
| < 1 minimum salary                                     | - | | - | |
| ≥ 1 minimum salary                                     | 1.34 (0.96–1.87) | 0.08    | - | |
| Obtained crack illegally                                |            |         |            |         |
| Yes                                                    | - | | - | |
| No                                                     | 1.61 (1.00–2.60) | 0.05    | - | |
| Largest period of abstinence from crack                 |            |         |            |         |
| Less than one month                                    | 2.16 (1.39–3.37) | <0.001  | 3.20 (1.91–5.35) | <0.001 |
| More than one month                                    | - | | - | |
| Moment in which uses alcohol                            |            |         |            |         |
| Simultaneously with crack use                           | - | | - | |
| After using crack                                       | 0.35 (0.23–0.54) | <0.001  | 0.31 (0.19–0.50) | <0.001 |
| Before using crack                                      | 1.69 (1.09–2.63) | 0.01    | 1.81 (1.13–2.89) | 0.01 |
| Used health services in the 12 previous months          |            |         |            |         |
| Yes                                                    | - | | - | |
| No                                                     | 1.30 (0.92–1.84) | 0.12    | - | |
| Used services to treat dependence on alcohol, crack or other drug in the 12 previous months |            |         |            |         |
| Yes                                                    | 1.68 (1.19–2.36) | <0.001  | 1.85 (1.26–2.71) | <0.001 |
| No                                                     | - | | - | |
| Use of condom in the last sexual relationship            |            |         |            |         |
| Yes                                                    | - | | - | |
| No                                                     | 1.30 (0.92–1.82) | 0.13    | - | |
| Self-perception of the likelihood of being infected with HIV |            |         |            |         |
| None                                                    | 1.54 (1.05–2.25) | 0.02    | - | |
| Low                                                    | - | | - | |
| High                                                   | 1.21 (0.77–1.92) | 0.39    | - | |
| Committed physical violence at some point in life       |            |         |            |         |
| Yes                                                    | 1.55 (1.06–2.26) | 0.02    | 1.67 (1.08–2.56) | 0.01 |
| No                                                     | - | | - | |
| Was arrested at some point in life                      |            |         |            |         |
| Yes                                                    | 1.28 (0.91–1.79) | 0.14    | - | |
| No                                                     | - | | - | |

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Based on the multivariate analysis, we can observe that alcohol use before crack is associated with consumption of a higher number of stones and with a shorter period of abstinence from crack; in addition, it is associated with greater vulnerability to commit physical violence and with looking for treatment services. Crack craving leads to a pattern of compulsive use of the drug, contributing to increase dependence [33]. Consequently, in face of the urgency to obtain it, people who use crack can get involved in risk situations, with aggressive and violent behaviors [34]. However, we found that, in the context of compulsive crack use associated with violence, the participants often reported looking for dependence treatment services.

This research has some limitations concerning its design, as it is a cross-sectional observational study, which, a priori, does not allow establishing a causal relationship. Even though we performed the investigation respecting the temporality of the facts, there is the problem of the participants’ memory bias.

Another limitation is the fact that the components of the studied population have a very similar socioeconomic profile, as they were recruited in a public social protection service. On the other hand, the characteristics identified in the majority of the participants (man aged 25 years or older, with brown skin color, single, with low level of schooling and low income) (Table 1) are similar to those presented in the profile of people who use crack in Brazil, described in the pioneering national study carried out by Fundação Oswaldo Cruz in partnership with Brazil’s National Department of Drug Policies [6], which enabled the extrapolation of our findings.

Final remarks

This study was developed in a population of the Northeastern region of Brazil, which concentrates approximately 40% of the population that uses crack regularly in the country and has characteristics that are different from those of the other Brazilian regions in relation to social, cultural, ethnic, and economic parameters, and to the culture of crack use. These differences might influence our results regarding the reports on the influence of the alcohol effect on crack effect, depending on the moment of their consumption. However, the findings were analogous to those available in the literature, showing that, depending on the theme, some aspects of the culture of crack use seem to be similar in different places, independently of regional characteristics.

In short, the findings of this study indicate that the effect of alcohol use can interfere, in different ways, in the effects of crack, depending on the moment in which the drugs are consumed. When alcohol was consumed before crack, it was related to increased crack craving and a consumption of a greater amount number of stones. However, when alcohol was consumed after crack, it was often characterized as a way of reducing the paranoia and/or craving caused by crack.

We highlight, as one of the findings of this study, that use of alcohol before crack consumption is associated with characteristics that suggest a greater vulnerability to patterns of harmful crack use, such as staying in abstinence for a shorter time, consumption of higher number of stones per day and higher frequency of reports on committing aggressive acts. On the other hand, people who use alcohol before crack also reported a greater demand for dependence treatment services, which shows the need of public facilities to shelter and offer treatment to people with intense consumption.

Employment of the mixed method approach used currently provided evidence for linking particular patterns of alcohol consumption with the expected outcome of crack cocaine use. For instance, the perceived stigma of crack cocaine use might be attenuated by alcohol consumption. Alcohol use may also be implemented during or after crack cocaine use in order to
prevent some of the negative effects associated with cocaine, such as anxiety or psychosis. Unfortunately, it appears that the negative outcomes and the perpetuation of drug taking may be amplified by the combination of alcohol and crack cocaine. We hypothesize that such interactions induce a vicious cycle for the consumption of the two substances, which is strengthened by the higher frequency of daily use of crack found among those who use alcohol on a daily basis. These findings reinforce the need to enhance comprehensive alcohol treatment and harm reduction approaches.

Supporting information

S1 Appendix. Questionnaire.
(DOCX)

S2 Appendix. Interview guide.
(DOCX)

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References

1. Costa JSD, Silveira MF, Gazalle FK, Oliveira SS, Hallal PC, Menezes AMB, et al. Consumo abusivo de álcool e fatores associados: estudo de base populacional. Saúde Pública [Internet]. 2004 abr [cited
2. World Health Organization. Global status report on alcohol and health. Geneva: The Organization; 2018. p.450. Available from: https://www.who.int/substance_abuse/publications/global_alcohol_report/gsr_2018/en/

3. Bastos FI. III Levantamento Nacional sobre o Uso de Drogas pela População Brasileira. Rio de Janeiro: Fundação Oswaldo Cruz, Instituto de Comunicação e Informação Científica e Tecnologia em Saúde, (ICICT/FIOCRUZ). Levantamento nº 2017 [Internet]. Patrocinado pela Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro e Conselho Nacional de Pesquisa Científica e Tecnológica. Português.

4. Higgins ST, Sigmon SC, Wong CJ, Heil SH, Badger GJ, Donham R, et al. Community reinforcement therapy for cocaine-dependent outpatients. Arch. Gen. Psychiatry. 2003; 60 (1):1043–1052. https://doi.org/10.1001/archpsyc.60.9.1043 PMID: 14557150

5. Dias AC, Araújo MR, Laranjeiras R. Evolução do consumo de crack em coorte com histórico de tratamento. Saúde Pública [Internet]. 2011 mai [cited 2020 jul 06]; 45 (5): 938–948. Português. Available from: https://www.scielo.br/pdf/rsp/v45n5/256.pdf

6. Bastos FI, Bertoni N. Perfil dos usuários de crack e/ou similares no Brasil. Livro Epidemiológico [Internet]. Rio de Janeiro (RJ): Fundação Oswaldo Cruz, Instituto de Comunicação e Informação Científica e Tecnológica em Saúde (ICICT–FIOCRUZ); Relatório nº 2013. Patrocinado pela Secretaria Nacional de Políticas sobre Drogas. Português. Available from: https://www.icict.fiocruz.br/sites/www.icict.fiocruz.br/files/livro_epidemiologico_17set.pdf

7. Santos NTV, Almeida RBF, Brito AM. Vulnerabilidade de usuários de crack ao HIV e outras doenças transmissíveis: estudo socioambiental e de prevalência no estado de Pernambuco. Recife (PE): Fundação Oswaldo Cruz, Centro de Pesquisas Aggeu Magalhães; Caderno de apresentação de dados principais (pesquisa) nº 2016 [Internet]. Patrocinado pela Secretaria de Vigilância em Saúde do Ministério da Saúde do Brasil. Português. Available from: https://www.cppam.fiocruz.br/crackhiv

8. Rocha WS, Alves ERP, Vieira KFL, Barbosa KKS, Leite GO, Dias MD. Conceções dos usuários de crack sobre os fatores que influenciam o uso e a dependência. Saúde Mental Alcool e Drogas [Internet]. 2015 set [cited 2020 jul 10]; 11(3): 129–135. Português. Available from: https://www.revistas.usp.br/smad/article/view/116767/0

9. Magura S, Rosenblum A. Modulating effect of alcohol use on cocaine use. Addictive Behaviors [Internet]. 2000 jan-feb [cited 2020 jul 10]; 25 (1): 117–122. Available from: https://pubmed.ncbi.nlm.nih.gov/10708326/ https://doi.org/10.1016/s0306-4603(98)00128-2 PMID: 10708326

10. Teixeira MB, Engstrom EM, Ribeiro JM. Revisão sistemática da literatura sobre crack: análise do seu uso prejudicial nas dimensões individual e contextual. Saúde em Debate. 2017; 41 (12): 311–300. Português.

11. Ribeiro L, Sanchez Z, Nappo S. Surviving crack: a qualitative study of the strategies and tactics developed by Brazilian users to deal with the risks associated with the drug. BMC Public Health [Internet]. 2010 nov [cited 2020 jul 10]; 10 (671): 1–10. Available from: https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-10-671 PMID: 21050465

12. Parker RB, Laizurs SC. The Effect of Ethanol on Oral Cocaine Pharmacokinetics Reveals an Unrecognized Class of Ethanol-Mediated Drug Interactions. Drug Metab. Dispos. 2010; 38:317–322. https://doi.org/10.1124/dmd.109.030056 PMID: 19920055

13. Castro-Neto AG, Albuquerque RCR, Medeiros FFP, Uchôa R. Neuroscience of Alcohol and Crack Cocaine Use: Metabolism, Effects and Symptomatology In: Preddy VR. Neuroscience of Alcohol: Mechanisms and Treatment. Cambridge: Academic Press; 2019. p.573–544.

14. Jorge M. Ritual de consumo de crack: aspectos socioantropológicos recuperação para a saúde do usuário. Ciência. Saúde Coletiva. 2013; 18 (10): 2909–2918. Português.

15. Acioli Neto M. Os contextos de uso do crack: representações e práticas sociais entre usuários. 1ª ed. Recife: Novas Edições Acadêmicas; 2014. Português.

16. Barbosa KKS, Rocha WS, Vieira KFL, Alves ERP, Leite GO, Dias MD. Conceções de usuários de crack acerca da droga. Revista de Enfermagem da UFSM. 2015; 5: 286–294. Português.

17. Dualibí LB, Ribeiro M, Laranjeira R. Profile of cocaine and crack users in Brazil. Cad. Saúde Pública [Internet]. 2008 [cited 2020 jul 11]; 24 (Suppl 4): s545–s557. Available from: https://www.scielo.br/scielo.php?script=sci_arttext&pid=S0102-311X2008000600007 https://doi.org/10.1590/s0102-311x2008000600007 PMID: 18797730

18. Singulane RBA, Silva NB, Sartes LMA. Histórico e Fatores Associados à Criminalidade e Violência entre Dependentes de Crack. Rev. Psico-USF. 2016; 21 (2), 395–407. https://doi.org/10.1590/1413-82712016210215 Available from: https://www.scielo.br/pdf/pusf/v21n2/2175-3563-pusf-21-02-00395, pdf
Association between alcohol and crack

19. Santos LD. O perfil dos Lugares de uso de crack na cidade do Recife. Monografia. Recife: Programa de Residência Multiprofissional em Saúde Coletiva, Centro de Pesquisas Aggeu Magalhães, Fundação Oswaldo Cruz. 2013. Português. Available from: https://www.cpqam.fiocruz.br/bibpdf/2013santos-ld.pdf

20. Nappo SA, Sanchez ZM, Rameh-de-Albuquerque RC, et al. Virado: a new method of crack consumption in Brazil. American Journal on Addictions. 2012; 21 (6): 574. https://doi.org/10.1111/j.1521-0391.2012.00272.x Available from: https://pubmed.ncbi.nlm.nih.gov/23082841/ PMID: 23082841

21. Almeida RBF, Santos NTV, Brito AM, Silva KSB, Jacques IJAA, Nappo AS. El uso de virado como estratégia de reducción de daños entre los usuarios de crack del estado de Pernambuco, Brasil. Salud Colectiva. 2020; 16(1): e2528. https://doi.org/10.18294/sc.2020.2528. Español. Available from: https://scielosp.org/article/scol2020.v16.e2528/

22. Creswell JW, Clark PVL. Designing and conducting mixed methods research. Los Angeles: SAGE Publications; 2011.

23. Almeida RBF. O Caminho das Pedras: Cultura de Uso de Crack de Pernambuco. Tese. São Paulo: Escola Paulista de Medicina, Universidade Federal de São Paulo; 2017. Português. Available from: http://repositorio.unifesp.br/handle/11600/41858

24. Minayo MCS, Souza ER, Constantino P, Santos NC. Métodos, técnicas e relações em triangulação. In: Minayo MCS, Assis SG, Souza ER, organizadores. Avaliação por triangulação de métodos: abordagem de programas sociais. Rio de Janeiro: Fiocruz; 2005. p.71–104. Português.

25. Ratton JL (Coord.). Políticas de Drogas e Redução de Danos no Brasil: o Programa Atitude em Pernambuco. Recife: Núcleo de Estudos e Pesquisas em Políticas de Segurança/Universidade Federal de Pernambuco; 2016. Português.

26. Evans S. Licções Brasileiras de Saúde, Segurança e Cidadania-Crack: Reduzir Danos. Nova York: Open Society Foundations; 2017. Português.

27. Rigoni R, Breeksema J, Woods S. Speed Limits: Harm Reduction for People who use Stimulants. The Netherlands: Mainline, 2018.

28. Organização Pan-Americana da Saúde. Encuesta de comportamiento en CODAR: Herramientas básicas: Cuaderno 1 – Diseño del estudio, adaptación del cuestionario y indicadores. Washington: OPAS; 2008. ISBN: 978-9275-32907. Español. Available from: https://www.paho.org/hq/ddmdocuments/2009/Codar_cuaderno1.pdf

29. Malchy L, Bungay V, Johnson J. Documenting practices and perceptions of “safer”crack use: A Canadian pilot study. International Journal of Drug Policy. 2008; 19 (10):339–341. https://doi.org/10.1016/j.drugpo.2007.06.005 Available from: https://pubmed.ncbi.nlm.nih.gov/18638705/ PMID: 18638705

30. Thoft DS, Ward A, Youell J. Journey of ethics Conducting collaborative research with people with dementia. Dementia (London). 2020; 0(0): 1–20. https://doi.org/10.1177/1471301020919887 Available from: https://pubmed.ncbi.nlm.nih.gov/32326751/ PMID: 32326751

31. Patton MQ. Qualitative Research & Evaluation Methods. Los Angeles: SAGE Publications; 2014. ISBN 9781483014575

32. Bardin L. Análise de Conteúdo. Lisboa: Edições; 2004. 223 p. Português.

33. Chaves TV, Sanchez ZM, Ribeiro LA, Nappo SA. Crack cocaine craving: behaviors and coping strategies among current and former users. Rev Saude Publica. 2011; 45 (6): 1168–75. https://doi.org/10.1590/s0047-2085201000066 Available from: https://pubmed.ncbi.nlm.nih.gov/21894428/ PMID: 21894428

34. Trape CNA, Jehel L, Lacoste J. Early Cannabis use is associated with severity of cocaine-induced Psychosis among cocaine smokers in Martinique, French West Indies. J Addict Med. 2014; 8(1):33–34. https://doi.org/10.1097/ADM.0000000000000003 Available from: https://pubmed.ncbi.nlm.nih.gov/24481081/ PMID: 24481081

35. Ribeiro LA, Sanchez ZM, Nappo SA. Estratégias desenvolvidas por usuários de crack para lidar com os riscos decorrentes do consumo da droga. J. bras. Psiquiatr. 2010; 59 (3):210–218. https://doi.org/10.1590/S0047-2085201000000007 Available from: https://www.scielo.br/scielo.php?pid=S004720852010000000007&script=sci_abstract&tlng=pt

36. Leite SC, Oliveira MM, Cruz VC. O encontro com o crack: início, tempo, quantidade diária e formas de uso. SMAD, Rev. Eletrônica Saúde Mental Alcool Drog. 2015; 11(2):97–104. ISSN: 1806-697620150002000066&lng=pt&nrnm=iso&tlng=pt

37. Rohtenow and Monti D.J. Monti Rohtenow, P.M. Does urge to drink predict relapse after treatment? Alcohol Res Health. 1999; 23(3): 225–232. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6760369/ PMID: 10890818
38. Daniuaityte R, Carlson RG, Siegal HA. “Heavy users”, “controlled users” and “quitters”: understanding patterns of crack use among women in a Midwestern City. Substance Use and Misuse. 2007; 42: 129–152. https://doi.org/10.1080/10826080601174678 Available from: https://pubmed.ncbi.nlm.nih.gov/17366129/ PMID: 17366129

39. Robinson and Berridge TE, Robinson KCB. Incentive-sensitization and addiction. Addiction. 2001; 96 (1): 103–114. https://doi.org/10.1046/j.1360-0443.2001.9611038.x Available from: https://pubmed.ncbi.nlm.nih.gov/11177523/ PMID: 11177523

40. Crane HM et al. Prevalence and Factors Associated with Hazardous Alcohol Use Among Persons Living with HIV Across the US in the Current Era of Antiretroviral Treatment. AIDS Behav. 2017; 21 (7):1914–1925. https://doi.org/10.1007/s10461-017-1740-7 Available from: https://pubmed.ncbi.nlm.nih.gov/28285434/ PMID: 28285434

41. Gonçalves JR, Nappo SA. Factors that lead to the use of crack cocaine in combination with marijuana in Brazil: a qualitative study. BMC Public Health. 2015; 15:706. https://doi.org/10.1186/s12889-015-2063-0 Available from: https://pubmed.ncbi.nlm.nih.gov/26209238/ PMID: 26209238

42. Eastwood B, Strang J, Marsden J. Change in alcohol and other drug use during five years of continuous opioid substitution treatment. Drug and Alcohol Dependence. 2019; 194: 438–446. https://doi.org/10.1016/j.drugalcdep.2018.11.008 Available from: https://pubmed.ncbi.nlm.nih.gov/30502545/ PMID: 30502545

43. Gossop M, Manning V, Ridge G. Concurrent use and order of use of cocaine and alcohol: behavioral differences between users of crack cocaine and cocaine powder. Addiction. 2006; 101:1292–8. https://doi.org/10.1111/j.1360-0443.2006.01497.x Available from: https://pubmed.ncbi.nlm.nih.gov/16911728/ PMID: 16911728

44. Sayago CB, et al. Fatores protetivos e de risco para o uso de crack e danos decorrentes de sua utilização: revisão de literatura. Aletheia, Canoas. 2013; 42: 164–174. Português. Available from: http://hdl.handle.net/10316/47129