

Health consequences associated with prolonged exposure to counterfeit petrol in different age strata in Benin

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Abstract

Background: Counterfeit fuel is sold in Benin by all socio-demographic groups with serious health consequences. The aim of this study was to assess differences in health consequences associated with exposure to petrol based on the age of vendors. **Material & Methods:** Data was collected by interviewing 150 petrol vendors in the municipality of Abomey-Calavi and analyzed with emphasis on comparison between age groups using the two-tailed Z test. **Results:** The present study shows that the proportion of vendors aged 20 to 30 working more than 8 hours per day (27.03%) was significantly higher ($p < 0.05$) than those under 20, and over 40. Incidents like inhaling and swallowing petrol was more reported ($p < 0.05$) in vendors aged 20 to 30 than those under 20 and over 40 years old. The respondents, especially those aged 30 to 40, do not protect themselves sufficiently and experience many health problems. The vendors aged 20 to 30 years who experienced headache, dizziness, cough, fatigue, sleepiness, nausea, vomiting and eye irritation was higher ($p < 0.05$) than those under 20 and over 50. Likewise, the proportion of people aged 20 to 50 years who presented symptoms such as stuffed nose, pressing need to expectorate upon awakening and episodes of rhinorrhea was higher ($p < 0.05$) than in those under 20 and over 50. **Conclusion:** In conclusion, people aged 20 to 30 experience more health consequences associated with the sale of counterfeit petrol and must take necessary measures for their protection.

Key words: Counterfeit petrol, pathology, age, Benin

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Introduction

Energy consumption is the basis of all comforts and quality of human life. These energies come from different sources, among which petroleum products are the most widely known. They are part of our daily life and are indispensable in the transport sector and without them no economic activity is possible. The marketing of

these petroleum products takes place in two forms in Benin which are the formal and the informal business [1,2]. The formal sector is well organized with standards for storage, protection and sale imposed by law. In the informal sector however, petrol is sold in bottles by the road side by people without protective equipment and stored in plastic cans [2]. Under these conditions, the risks associated with this activity are enormous, ranging from security problems to health problems [3]. The safety problems engendered by this activity are often fires and are quickly perceived by decision-makers who have made sufficient recommendations such as banning fires at the point of

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sale and home storage of petrol in order to limit the risks. On the other hand, health problems often go unnoticed because they are felt by the vendors and people in their surroundings. These health problems include skin and eye problems (inflammation of the skin, dermatitis, burns, irritation of the eyes etc.), respiratory stress (exudative tracheobronchitis, intrapulmonary hemorrhage, pulmonary congestion, pulmonary dysfunction), digestive (esophagitis, gastritis, mucus of the oral cavity), and mental (anxiety disorder, depression, psychological stress), etc. [4].

General clinical signs such as fatigue, nervous attacks, sleepiness and pain are also reported [4–7]. The health consequences of counterfeit petrol can vary depending on the age, sex, diet, lifestyle and state of health of the exposed person [4]. Since petrol vendors are men and women in Benin, the distribution of declared ailments following the sale of this product varied greatly by sex [8]. To better appreciate the descriptive epidemiology of these ailments declared with the aim of making prevention integrated into the lifestyle of the stakeholders, all the factors likely to influence the health consequences of counterfeit petrol must be studied. Since the vendors are of all age groups, this study aims to assess differences in health consequences associated with exposure to petrol based on the age of vendors in Benin.

Material and methods

Study area

The present study was conducted in the commune of Abomey-Calavi, located in the southern part of the Republic of Benin and in the Atlantic Department. This municipality is bounded to the north by the municipality of Zè, to the south by the Atlantic Ocean, to the east by the municipalities of Sô-Ava and Cotonou, and to the west by the municipalities of Tori-Bossito and Ouidah. It is the largest municipality in the Department of Atlantic, of which it occupies more than 20%. It extends over an area of 539 km² representing 0.48% of the national area of Benin. The hydrographic network is essentially made of two water bodies, Lake Nokoué and the coastal lagoon. The population density varies considerably within this department and is 1218 inhabitants per km² in the municipality of Abomey-Calavi [9]. The main economic activities of the municipality are agriculture, fisheries, animal husbandry and trade.

Data collection

A descriptive cross-sectional study design was employed with a questionnaire survey among 150 vendors of counterfeit petrol. Information were collected about the vendors and their ways of protecting themselves. Data on marketing conditions were collected during the survey. The consequences related to the sale of counterfeit petrol were also listed as well

as frequently experienced clinical signs. Finally, the symptoms of upper respiratory track have been identified. All this data was collected with an interview guide.

Influence of age on consequences associated with counterfeit petrol

For the evaluation of age groups on the variables studied, 5 age groups were formed. These were in the age group 15 to 20 (≤ 20), 21 to 30, 31 to 40, 41 to 50 and 51 to 62 (>50). The data were processed by age group.

Statistical Analyses

The collected data was recorded in Excel and analyzed with SAS software (SAS Institute Inc., Cary, NC, USA). The observed frequencies were calculated by the SAS Proc FREQ procedure. The comparison of the relative frequencies between the age groups was made by the two-tailed Z test. For each relative frequency, a 95% confidence interval (CI) was calculated according to the formula:

$$IC = 1,96 \sqrt{\frac{P(1 - P)}{N}}$$

Where P is the relative frequency and N is the sample size.

The CA function of the FactoMineR library of R was used for factorial correspondence analysis (CFA) [10,11]. The variables taken into account in the correspondence analysis are the age groups and the symptoms experienced by sellers of counterfeit petrol. The round function was used to determine the most affected age group and the most reported symptoms. Energy consumption is the basis of all comforts and quality of human life. These energies come from different sources, among which petroleum products are the most widely known. They are part of our daily life and are indispensable in the transport sector and without them no economic activity is possible. The marketing of these petroleum products takes place in two forms in Benin which are the formal and the informal business [1,2]. The formal sector is well organized with standards for storage, protection and sale imposed by law. In the informal sector however, petrol is sold in bottles by the road side by people without protective equipment and stored in plastic cans [2]. Under these conditions, the risks associated with this activity are enormous, ranging from security problems to health problems [3]. The safety problems engendered by this activity are often fires and are quickly perceived by decision-makers who have made sufficient recommendations such as banning fires at the point of sale and home storage of petrol in order

to limit the risks. On the other hand, health problems often go unnoticed because they are felt by the vendors and people in their surroundings. These health problems include skin and eye problems (inflammation of the skin, dermatitis, burns, irritation of the eyes etc.), respiratory stress (exudative tracheobronchitis, intrapulmonary hemorrhage, pulmonary congestion, pulmonary dysfunction), digestive (esophagitis, gastritis, mucus of the oral cavity), and mental (anxiety disorder, depression, psychological stress), etc. [4]. General clinical signs such as fatigue, nervous attacks, sleepiness and pain are also reported [4–7]. The health consequences of counterfeit petrol can vary depending on the age, sex, diet, lifestyle and state of health of the exposed person [4]. Since petrol vendors are men and women in Benin, the distribution of declared ailments following the sale of this product varied greatly by sex [8]. To better appreciate the descriptive epidemiology of these ailments declared with the aim of making prevention integrated into the lifestyle of the stakeholders, all the factors likely to influence the health consequences of counterfeit petrol must be studied. Since the vendors are of all age groups, this study aims to assess differences in health consequences associated with exposure to petrol based on the age of vendors in Benin.

Results

Conditions of counterfeit petrol marketing

Counterfeit petrol is sold along the roadsides. The people surveyed often work more than 8 hours a day. The proportion of people aged 20 to 30 and working more than 8 hours a day (27.03%) was significantly higher ($p < 0.05$) than that of people under 20 (6.76%), 40 to 50 years (16.2%) and over 50 (10.81%). After several days of work of more than 8 hours per week, the vendors take a day off. The proportion of people aged 20 to 30 who rest once a week was significantly higher ($p < 0.05$) than those of other age groups (Table 1). Petrol inhalation, skin and mucous membrane contact, and gasoline swallowing were the incidents reported by the vendors. Inhalation was reported more ($p < 0.05$) by people aged 20 to 30 (27.6%) than by people under 20 (5.97%), from 40 to 50 years (16.4%) and over 50 (9.7%). The same is true for swallowing gasoline. Skin / mucosal contact was more reported ($p < 0.05$) by people aged 20 to 50 years than by people under 20 and over 50 (Table 1). The people surveyed, especially those aged 30 to 40, do not protect themselves sufficiently at their workplace.

Table 1: working hours and incidents

| Variables | ≤20 years | |]20-30 years] | |]30-40 years] | |]40-50 years] | | >50 years | |
|---------------------------------------|-----------|------|---------------|------|---------------|------|---------------|------|-----------|------|
| | % | CI | % | CI | % | CI | % | CI | % | CI |
| Daily working duration (n=148) | | | | | | | | | | |
| Less than 8h | 1.35a | 1.86 | 1.35a | 1.86 | 1.35a | 1.86 | 4.05a | 3.18 | 0.68a | 1.32 |
| 8h | 0a | 0.00 | 2.03a | 2.27 | 1.35a | 1.86 | 1.35a | 1.86 | 0.68a | 1.32 |
| More than 8h | 6.76d | 4.04 | 27.03a | 7.16 | 25.00ab | 6.98 | 16.22bc | 5.94 | 10.81cd | 5.00 |
| Weekly resting day (n=145) | | | | | | | | | | |
| Yes | 6.21c | 3.93 | 22.76a | 6.82 | 14.48b | 5.73 | 13.10b | 5.49 | 8.28bc | 4.49 |
| No | 2.07c | 2.32 | 6.90ab | 4.13 | 13.79a | 5.61 | 8.97ab | 4.65 | 3.45bc | 2.97 |
| Incidents encountered (n=134) | | | | | | | | | | |
| Inhalation | 5.97d | 4.01 | 27.61a | 7.57 | 23.13ab | 7.14 | 16.42bc | 6.27 | 9.70cd | 5.01 |
| Skin Contact | 2.99b | 2.88 | 20.90a | 6.88 | 15.67a | 6.16 | 15.67a | 6.16 | 8.21b | 4.65 |
| Swallowing | 3.73c | 3.21 | 19.40a | 6.70 | 17.16ab | 6.38 | 9.70bc | 5.01 | 4.48c | 3.50 |
| No incident | 0b | 0.00 | 2.99a | 2.88 | 0.75a | 1.46 | 0.75a | 1.46 | 0.75a | 1.46 |
| Other incidents | 2.24a | 2.51 | 4.48a | 3.50 | 2.99a | 2.88 | 1.49a | 2.05 | 0.75a | 1.46 |

CI : Confidence interval, percentages of the same row followed by the same letter do not differ significantly at a 5% threshold

Consequences of exposure to counterfeit petrol

Symptoms that vendors developed

People aged 20 to 50 are more aware ($p < 0.05$) of the consequences and clinical manifestations of diseases caused by exposure to adulterated gasoline than people aged under 20 and over 50 (table 2). The proportion of people experiencing symptoms such as headache, dizziness, fatigue, chest pain, cough, nausea and

vomiting decreased with increasing age. People aged 20 to 50 mentioned headache, nausea and vomiting as symptoms of selling gasoline more ($p < 0.05$) than people aged under 20 and over 50 years. The proportion of respondents aged 20 to 30 who reported symptoms such as sleepiness, chest pain, palpitations and skin irritation was significantly higher ($p < 0.05$) than that of people under 20 years old and over 30 years old. The

proportion of people aged 20 to 30 who reported dizziness (18.66%) and fatigue (24.63%) was significantly higher than that of those under 20 and over

40. Cough and eye irritation have been reported more in people aged 20 to 30 than in people under 20 and over 50.

Table 2 : Level of awareness on the negative consequences of the sale of counterfeit petrol

| Variables | ≤20 years | | [20-30 years] | | [30-40 years] | | [40-50 years] | | >50 years | |
|--|-----------|------|---------------|------|---------------|------|---------------|------|-----------|------|
| | % | CI | % | CI | % | % | CI | % | CI | % |
| Awareness of consequences (n=149) | | | | | | | | | | |
| Yes | 8.72c | 4.53 | 27.52a | 7.17 | 24.16a | 6.87 | 18.79ab | 6.27 | 11.41bc | 5.11 |
| No | 0b | 0.00 | 2.01ab | 2.25 | 3.36a | 2.89 | 3.36a | 2.89 | 0.67ab | 1.31 |
| Known consequences (n=134) | | | | | | | | | | |
| Headache | 2.99b | 2.88 | 20.15a | 6.79 | 14.93a | 6.03 | 13.43a | 5.77 | 6.72b | 4.24 |
| Dizziness | 3.73c | 3.21 | 18.66a | 6.60 | 11.19ab | 5.34 | 9.70bc | 5.01 | 8.21bc | 4.65 |
| Fatigue | 6.72c | 4.24 | 24.63a | 7.30 | 19.40ab | 6.70 | 14.18bc | 5.91 | 6.72c | 4.24 |
| Sleepiness | 0.75b | 1.46 | 15.67a | 6.16 | 5.22b | 3.77 | 3.73b | 3.21 | 5.22b | 3.77 |
| Chest pain | 2.99b | 2.88 | 17.91a | 6.49 | 6.72b | 4.24 | 7.46b | 4.45 | 5.22b | 3.77 |
| Cough | 3.73c | 3.21 | 17.16a | 6.38 | 10.45ab | 5.18 | 11.19ab | 5.34 | 5.97bc | 4.01 |
| Palpitations | 0.75b | 1.46 | 9.70a | 5.01 | 2.24b | 2.51 | 3.73ab | 3.21 | 2.99b | 2.88 |
| Nausea and vomiting | 1.49b | 2.05 | 8.21a | 4.65 | 6.72a | 4.24 | 6.72a | 4.24 | 4.48ab | 3.50 |
| Eye irritation | 2.99c | 2.88 | 14.93a | 6.03 | 9.70ab | 5.01 | 10.45ab | 5.18 | 5.22bc | 3.77 |
| Skin Irritation | 2.99b | 2.88 | 17.16a | 6.38 | 6.72b | 4.24 | 8.96ab | 4.84 | 5.22b | 3.77 |
| None | 0a | 0.00 | 0.75a | 1.46 | 0.75a | 1.46 | 0.75a | 1.46 | 0a | 0.00 |
| Others | 0.75ab | 1.46 | 2.99a | 2.88 | 2.99a | 2.88 | 1.49ab | 2.05 | 0b | 0.00 |

CI : Confidence interval, percentages of the same row followed by the same letter do not differ significantly at a 5% threshold

Commonly experiences symptoms

Symptoms commonly experienced by gasoline vendors are shown in Table 3. These were less reported by people under the age of 20. From the age of 20, the proportion of people who frequently experienced headaches, dizziness, fatigue, drowsiness, chest pain and cough decreased with increasing age. The proportions of people aged 20 to 30, 30 to 40, and 40 to 50 who experienced headaches frequently were significantly higher ($p < 0.05$) than those aged under 20 and over 50 years. People aged 20 to 50 had more ($p < 0.05$) dizziness and cough than people under 20 years old. Fatigue and sleepiness were more reported ($p < 0.05$) by people aged 20 to 30 than by people under 20 and over 50. Palpitations were more recorded ($p < 0.05$) in people over 20 years old than in people under 20 years old. The proportion of people aged 20 to 30 who reported nausea, vomiting, skin and eye irritation was significantly higher ($p < 0.05$) than that of people aged less than 20 years. Abdominal and lower back pain have not been reported in individuals under the age of 20.

Three axes were selected for the interpretation of the results of factorial correspondence analysis (CFA). These three axes represent 87.51% of the data, of which 56.46 % on the first axis, 17.37 % on the second axis and 13.68 % on the third axis. The results of the multiple correspondence analysis presenting the three gasoline sellers' groups are shown in Figure 1.

The first axis better represents people aged 51 to 62. These people are grouped by symptoms like palpitations, lower back pain, abdominal pain and difficulty breathing. Axis 2 regroups people aged 21 to 30 and 31 to 40. Symptoms of gasoline exposure associated with these age groups are headache, fatigue, drowsiness, Nausea, skin irritation, sneezing, stuffed nose, and episodes of rhinorrhea. Finally, people aged 15 to 20 and 41 to 50 are well presented on axis 3. These people are more distinguished by symptoms such as dizziness, chest pain, cough, feelings of oppression, and irritation of the throat.

Overall the most developed symptom following daily exposure to gasoline was fatigue followed by headache (Figure 2). People aged 21 to 30 experience these symptoms more (Figure 3).

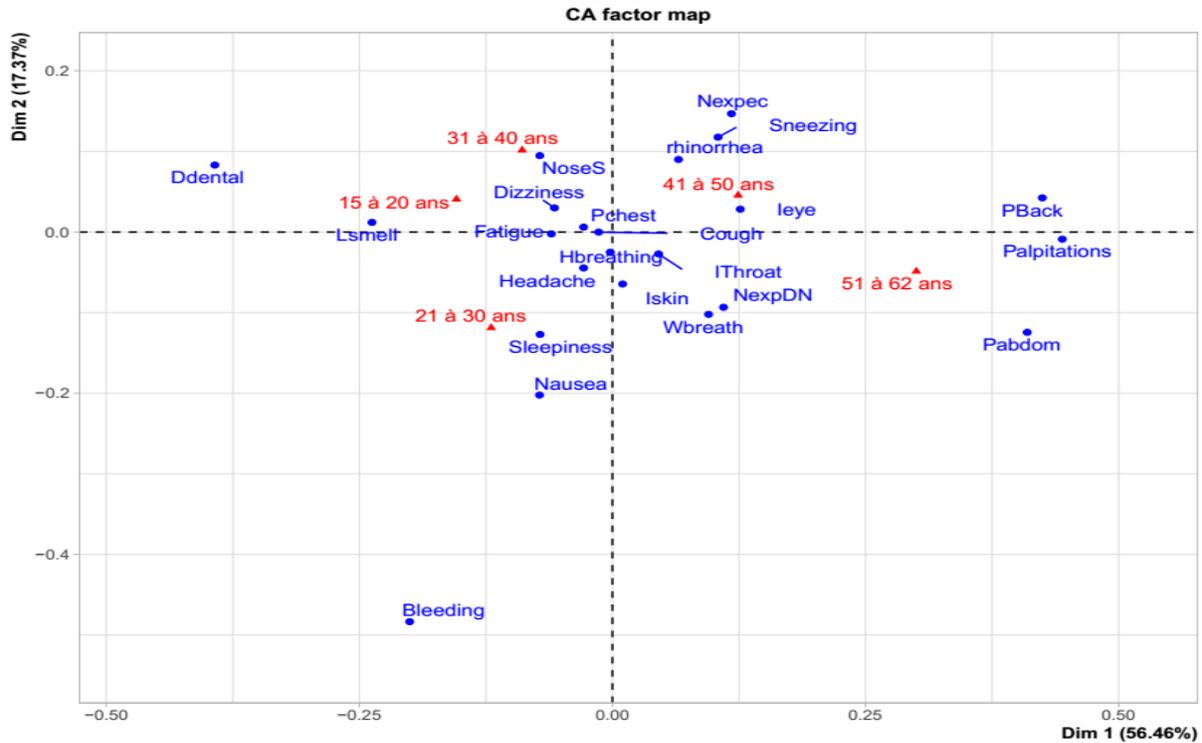


Fig 1 : Symptoms developed (*NezB : stuffed nose, Lsmell: loss of smell, Iskin: skin Irritation, Ieye : eye Irritation. Pchest: chest pain, Ddental: dental ailments, IThroat: Throat Irritation, Wbreath : breathing difficulty ; Hbreathing : Sensation of oppression, NexpDN: need to expectorate in the day or night, Nexpec: need to expectorate in the morning, Pback: lower back pain, Pabdom : abdominal pain).*

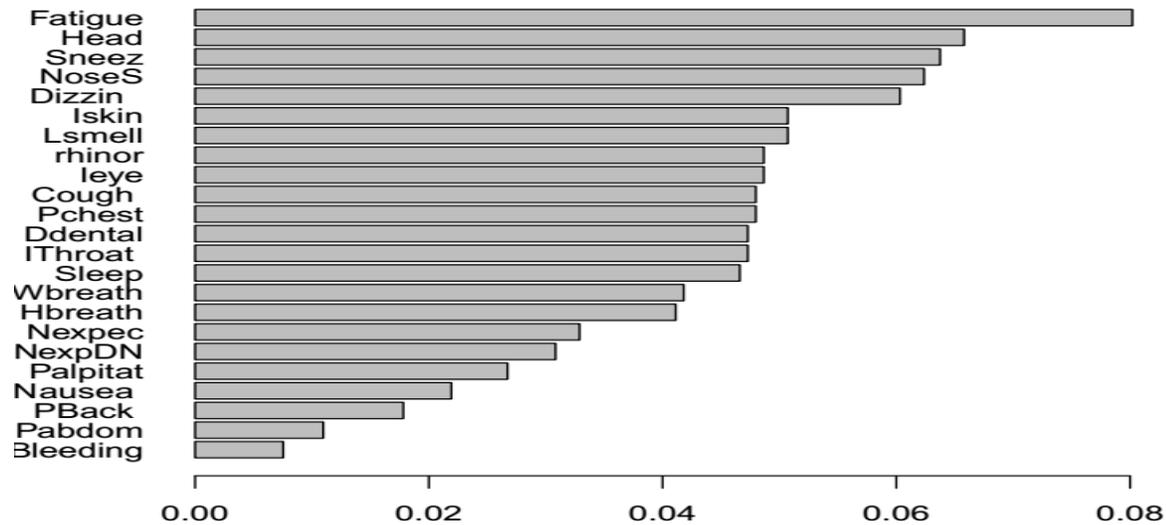


Fig 2 : Symptoms frequently reported (*head: headache. Sneez : sneezing, NoseS : stuffed nose, Lsmell: smell loss, Iskin : skin Irritation, Rhinor : rhinorrhea, Ieye: eye Irritation, Pchest : chest pain, Ddental : dental ailments. IThroat : throat Irritation, Hbreath: breathing difficulty ; Wbreath : Sensation of oppression, NexpDN : need to expectorate in the day or night, Nexpec: need to expectorate in the morning, Pback : lower back pain, Pabdom : abdominal pain).*

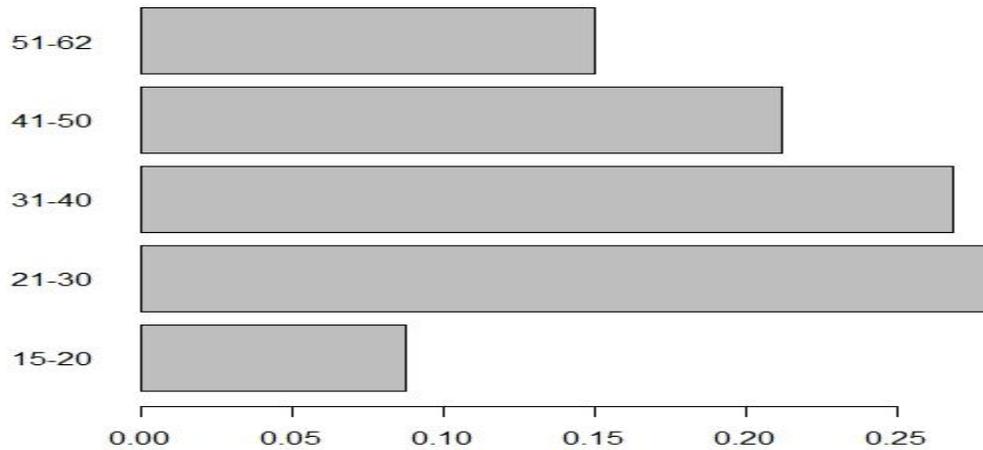


Fig 3 : Age groups reporting fuel related symptoms

Table 3 : Commonly reported symptoms among counterfeit fuel vendors

| Variables | ≤20 years | |]20-30 years] | |]30-40 years] | |]40-50 years] | | >50 years | |
|-------------------------|-----------|------|---------------|------|---------------|------|---------------|------|-----------|------|
| | % | CI | % | CI | % | CI | % | CI | % | CI |
| Symptoms (n=145) | | | | | | | | | | |
| Headache | 3.45b | 2.97 | 21.38a | 6.67 | 17.24a | 6.15 | 16.55a | 6.05 | 7.59b | 4.31 |
| Dizziness | 5.52c | 3.72 | 17.24a | 6.15 | 17.24a | 6.15 | 13.10ab | 5.49 | 7.59bc | 4.31 |
| Fatigue | 8.28d | 4.49 | 25.52a | 7.10 | 22.07ab | 6.75 | 15.86bc | 5.95 | 11.03cd | 5.10 |
| Sleepiness | 4.86c | 3.50 | 15.97a | 5.96 | 11.11ab | 5.12 | 8.33bc | 4.50 | 6.94bc | 4.14 |
| Chest pain | 6.21b | 3.93 | 13.1a | 5.49 | 11.72ab | 5.24 | 10.34a | 4.96 | 6.9ab | 4.13 |
| Cough | 4.14b | 3.24 | 13.79a | 5.61 | 13.1a | 5.49 | 10.34a | 4.96 | 6.9ab | 4.13 |
| Palpitations | 2.07b | 2.32 | 4.83ab | 3.49 | 4.83ab | 3.49 | 7.59a | 4.31 | 7.59a | 4.31 |
| Nausea and vomiting | 2.07b | 2.32 | 8.28a | 4.49 | 4.14ab | 3.24 | 4.83ab | 3.49 | 2.76b | 2.67 |
| Eye Irritation | 4.83b | 3.49 | 11.72a | 5.24 | 11.03ab | 5.10 | 13.1a | 5.49 | 8.28ab | 4.49 |
| Abdominal pain | 0b | 0.00 | 2.76a | 2.67 | 2.76a | 2.67 | 2.07ab | 2.32 | 3.45a | 2.97 |
| Back pain | 0b | 0.00 | 3.45a | 2.97 | 4.83a | 3.49 | 4.83a | 3.49 | 4.83a | 3.49 |
| Skin Irritation | 5.52b | 3.72 | 15.17a | 5.84 | 11.03ab | 5.10 | 11.72ab | 5.24 | 7.59b | 4.31 |
| None | 0a | 0.00 | 0.69a | 1.35 | 0a | 0.00 | 0a | 0.00 | 0.69a | 1.35 |
| Others | 1.38a | 1.90 | 1.38a | 1.90 | 3.45a | 2.97 | 0.69a | 1.35 | 1.38a | 1.90 |

CI : Confidence interval, percentages of the same row followed by the same letter do not differ significantly at a 5% threshold

Respiratory symptoms reported by counterfeit fuel vendors

The gasoline sellers met in Abomey-Calavi claimed to have developed signs of the respiratory ailments which are summarized in Table 4. From 20 years to over 50 years. the proportion of people having experienced symptoms such as sneezing, stuffy nose, loss of smell. bleeding from the nose, irritation of the throat, dental disease in the premolars or molars, cough and the need to expectorate on waking in the morning decreases as age increases. Sneezing and throat irritation were more reported (p<0.05) by people over 20 years old than by people under 20 years old. The proportion of people

aged 20 to 50 years who presented symptoms such as a stuffy nose, the need to expectorate upon awakening and episodes of rhinorrhea was significantly higher (p<0.05) than those of people under 20 and over 50. Rhinorrhea was less purulent, less common and less bloody in people under the age of 20. The need to expectorate during the day and at night. the feeling of chest tightness. and difficulty breathing when walking or climbing a grade were more reported (p<0.05) in people aged 20 to 40 years than in people under 20 and over 50. Sellers aged 20 to 40 also lost more (p<0.05) smell and had more (p<0.05) dental disease in the premolars / molars than those under 20 and over 40

years. No vendor under the age of 20 has the problem of bleeding from the nose.

Table 4 : Respiratory symptoms

| Variables | ≤20 years | |]20-30 years] | |]30-40 years] | |]40-50 years] | | >50 years | |
|---|-----------|------|---------------|------|---------------|------|---------------|------|-----------|------|
| | % | CI | % | CI | % | CI | % | CI | % | IC |
| Respiratory symptoms (n=133) | | | | | | | | | | |
| Sneezing | 6.02b | 4.04 | 15.04a | 6.08 | 19.55a | 6.74 | 18.05a | 6.54 | 11.28ab | 5.38 |
| Stuffed nose | 6.02b | 4.04 | 18.05a | 6.54 | 21.80a | 7.02 | 14.29a | 5.95 | 8.27b | 4.68 |
| Smell loss | 6.02b | 4.04 | 18.05a | 6.54 | 18.05a | 6.54 | 8.27b | 4.68 | 5.26b | 3.79 |
| Bleeding from the nose | 0b | 0.00 | 4.51a | 3.53 | 1.50ab | 2.07 | 1.50a | 2.07 | 0.75ab | 1.47 |
| Throat Irritations | 4.51b | 3.53 | 14.29a | 5.95 | 14.29a | 5.95 | 9.02a | 4.87 | 9.77ab | 5.05 |
| Dental diseases | 6.02b | 4.04 | 17.29a | 6.43 | 19.55a | 6.74 | 6.77b | 4.27 | 2.26b | 2.53 |
| Coughing | 0.75b | 1.47 | 3.01a | 2.90 | 5.26a | 3.79 | 2.26ab | 2.53 | 4.51a | 3.53 |
| Need to expectorate in the morning | 2.26b | 2.53 | 7.52a | 4.48 | 11.28a | 5.38 | 9.02a | 4.87 | 6.02b | 4.04 |
| Need to expectorate in the day and nights | 2.26b | 2.53 | 9.77a | 5.05 | 9.02a | 4.87 | 5.26ab | 3.79 | 7.52ab | 4.48 |
| Heavy breathing | 4.51b | 3.53 | 12.78a | 5.67 | 12.03a | 5.53 | 8.27ab | 4.68 | 7.52ab | 4.48 |
| Hard to breath during walking | 3.76b | 3.23 | 13.45a | 5.80 | 11.28a | 5.38 | 9.02ab | 4.87 | 9.02ab | 4.87 |
| Rhinorrhea | 3.76b | 3.23 | 12.78a | 5.67 | 15.79a | 6.20 | 12.78a | 5.67 | 8.27b | 4.68 |
| Aspects of the rhinorrhea (n=67) | | | | | | | | | | |
| Purulent | 1.49b | 2.90 | 16.42a | 8.87 | 14.93a | 8.53 | 10.45a | 7.33 | 10.45a | 7.33 |
| Bloody | 0a | 0.00 | 0a | 0.00 | 0a | 0.00 | 0a | 0.00 | 1.49a | 2.90 |
| Simple | 5.97b | 5.67 | 8.96ab | 6.84 | 17.91a | 9.18 | 14.93ab | 8.53 | 8.96ab | 6.84 |

CI : Confidence interval, percentages of the same row followed by the same letter do not differ significantly at a 5% threshold

Management of the felt symptoms

The vendors consulted doctors very little for their symptoms regardless of the age group (Table 5). No vendors under the age of 20 goes to a medical

consultation. In the event of a consultation, people aged 30 to 40 go more (p<0.05) to health centers than people aged over 50. Radiological and blood examinations were the examinations carried out by the respondents.

Table 5: Management of health risks

| Variables | ≤20 years | |]20-30 years] | |]30-40 years] | |]40-50 years] | | >50 years | |
|-------------------------------------|-----------|-----|---------------|-------|---------------|-------|---------------|-------|-----------|-------|
| | % | CI | % | CI | % | CI | % | CI | % | CI |
| Health Consultation (n=144) | | | | | | | | | | |
| Oui | 0b | 0.0 | 3.47a | 2.99 | 6.25a | 3.95 | 4.17a | 3.27 | 2.78a | 2.69 |
| Non | 8.3c | 4.5 | 27.08a | 7.26 | 20.83ab | 6.63 | 17.36b | 6.19 | 9.72c | 4.84 |
| Place of consultation (n=25) | | | | | | | | | | |
| Health center | 0c | 0.0 | 16ab | 14.37 | 36a | 18.82 | 20ab | 15.68 | 12bc | 12.74 |
| Traditional healer | 0a | 0.0 | 8a | 10.63 | 4a | 7.68 | 4a | 7.68 | 4a | 7.68 |
| Types of examination (n=149) | | | | | | | | | | |
| X-ray | 0a | 0.0 | 0a | 0.00 | 21.43a | 21.49 | 7.14a | 13.49 | 7.14a | 13.49 |
| Blood test | 0b | 0.0 | 21.4ab | 21.49 | 28.57a | 23.66 | 7.14ab | 13.49 | 21.4ab | 21.49 |

CI : Confidence interval, percentages of the same row followed by the same letter do not differ significantly at a 5% threshold

Discussion

Conditions of petrol business in Abomey-Calavi

Counterfeit petrol is sold on the side of the road as reported by Akiyo et al, [12] in Cotonou. Vendors aged 20 to 40 work more hours a day than those over 50 because these people are younger and have more responsibilities. This also justifies the fact that they work more than 8 hours a day than people under 20 years old. The profile of people under 20 justifies the

fact that they do not work more than 8 hours a day like people aged 20 to 50. They do not have capital for this activity and work for other people. People between the ages of 20 and 30 have more time in the week to rest than people between the ages of 30 and 50 because this age group needs leisure, and fewer responsibilities and needs to be met. Compared to the age group of 20 to 30 years, the expenses of people aged 30 to 50 years are

higher and take into account the essential needs of children, parents, spouse (s), schooling for children and others. while people aged 20 to 30 only have to take care of the needs of their wives and children (young and rarely exceeding 2 people). People aged 20 to 30 get more rest than people under 20 and over 50 because they work more. Continuous daily work with long hours per day exposes vendors to adverse health effects of gasoline due to inhalation of volatile organic compounds released by this fuel such as benzene, Toluene, ethyl-benzene, xylene. etc [6]. Vendors, especially those in the 20-30 age group, can minimize this risk if they protect themselves properly. Unfortunately, the latter do not protect themselves and are confronted with incidents such as inhaling gasoline. contacting the skin and mucous membranes with gasoline and swallowing gasoline. People aged 20 to 30 have more of these incidents than people over 40 because they work harder and become reckless under the effect of fatigue. Half of the compounds inhaled in gasoline (benzene, toluene, ethylene and xylene) are absorbed by the body. which can lead to many health risks such as cancer, neurological diseases and teratogenic effects [6].

Health consequences associated with counterfeit petrol

Symptoms developed by vendors

Vendors aged 20 to 50 are more familiar with the symptoms of selling adulterated gasoline than people over 50 because they are more involved in the business. In addition, awareness activities on adulterated gasoline are more carried out on the internet and social networks to which people aged 20 to 50 have more access. These vendors also know the symptoms more than people under the age of 20 because they are more experienced. The proportion of individuals who reported symptoms such as headache, Dizziness, fatigue, chest pain, cough, nausea and vomiting decreases with increasing age and this shows the limitations of the declarative method used in this study. The proportion of people should increase with the age of the respondents given their experience, but since the data is not recorded, they would have forgotten them over time. Symptoms like fatigue, skin conditions and respiratory ailments have also been reported among vendors of adulterated gasoline in Cameroon [13] and among petrol station workers in India and Iran [6,14].

Commonly experienced symptoms

People under the age of 20 experience the symptoms of selling less because they are less active in this activity. The body of active sellers gradually adapts to difficulties and justifies the fact that the proportion of people who frequently experienced headaches, Dizziness, Fatigue, sleepiness, chest pain and cough decreased with increasing blood pressures. This

disappearance of symptoms with age would also be motivated by self-medication [13]. The disappearance of symptoms does not protect sellers from disease because the damage to the body increases with duration in the business [14]. Over the age of 40. the body gets tired and vendors develop symptoms such as palpitations and lower back pain. However, symptoms like fatigue and sleepiness are more reported in people aged 20 to 30 than in people over 50 years old because of the working time per day exceeding more than 8 hours in people of 20 to 30 years old. People over the age of 20 experienced abdominal pain, nausea, vomiting, and skin irritation more than people under the age of 20 because they have more problems with swallowing and contact with the fuel.

Respiratory symptoms among counterfire petrol vendors

Gasoline vendors met in Abomey-Calavi claimed to have developed signs of respiratory ailments as reported by Eloundou [13] in Cameroon. The onset of these symptoms is due to the reduction in lung function with the duration of exposure to gasoline [15]. The reduction in lung function decreases with the duration of exposure [15] and justifies the decrease in the proportion of people who have experienced symptoms such as sneezing. stuffy nose. loss of smell. bleeding through the nose. irritation of the throat. dental disease in the premolars or molars. coughing and the need to expectorate on awakening in the morning has with increasing age. The decrease in people inhaling gasoline with increasing age also justifies this decrease in pulmonary symptoms with age.

Management of the symptoms

The people surveyed do very little consultation. which shows that these people are self-medicating since the symptoms they feel should be treated. Self-medication has already been reported by Eloundou [13] among gasoline sellers in Cameroon. People between the ages of 20 and 30 should normally see a doctor to check the condition of their nervous system. heart. kidneys. liver or lungs. given their apparently longer exposure time. However. so far there is no product to remove inhaled gasoline from the body; treatments remain symptomatic and protection remains the best remedy [16]. The diagnosis should be made correctly and people with severe symptoms should be observed for a long time as the chemicals have been shown to cause bone marrow depression and cancer [17].

The age effects

Aging deeply affects the immune system; it is characterized by numerous changes in hematopoiesis, adaptive and innate systems, associated with a pro-inflammatory environment [18]. The consequence of this weakening of the immune system is the sensitivity of the elderly to diseases [18,19]. Thus. one expected an

increase in the frequencies of symptoms with the age of the respondents. Unfortunately, from the age of 20 to over 50, there is a decrease in the frequency of symptoms such as headache, dizziness, fatigue, Sleepiness, coughing, nausea, vomiting. Sneezing, throat irritation. feeling of chest tightness. difficulty in breathing and episodes of rhinorrhea with increasing age. This finding shows the effect of exposure to gasoline on the appearance of these symptoms.

Conclusion

The study shows that conditions for the sale of counterfeit petrol are more difficult among young people (long working hours. lack of protection and contact with gasoline). Because of this, young people often experience fatigue, Nausea, headache, dizziness. skin irritation, sneezing and difficulty breathing than older people. To preserve their health. gasoline sellers. especially young people. must reduce their daily working hours and protect themselves properly by wearing masks, gloves and suitable clothing. However, these difficulties were recorded on declarations of the sellers and it is essential to verify them by examinations and medical analyzes.

Ethical Approval

The study was approved by the National Committee of Ethics for Health Research (CNERES).

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