INNSPUB

RESEARCH PAPER

Use of oral contraception ‹‹pills›› and their effects on blood glucose among students of Public Universities of Côte d'Ivoire

Ahebié Magne Elisabeth[1*], Zougrou N'Guessan Ernest[1], Kablan Kassi Jean-Jacques[1], Essien N'Da Georgette[1], Kouakou Koffi[1]

[1]*UFR-Biosciences, Université Félix HOUPHOUËT-BOIGNY, 22 BP 582 Abidjan 22, Côte d'Ivoire*

Abstract

This study, which takes stock of the known carbohydrate metabolic effects of oral contraception in order to propose practical conduct, was conducted in the Public Universities of Côte d'Ivoire. A total of 1485 female students were randomly selected. Among the students surveyed from the six Universities, 400 came from Felix Houphouët Boigny University, 243 from Nangui Abrogoua University and 211 were from Jean Lorougnon Guédé University. Those from the University of Man numbered 57 people and the students from the Universities Alassane Ouattara and Péléforon Gon were respectively 343 and 231. The sampling showed that five types of pills were used by the students, namely Pregnon, Levo-BD, Norlevo, Confiance and Stédiril. Among these pills, Pregnon was the most used pill, while Norlevo was the least used. This article also showed that all female students using oral contraception had normal blood sugar levels. And the use of the type of oral contraception depends on age, level of education and number of children.

* **Corresponding Author:** Ahebié Magne Elisabeth ✉ magneelisabethahebie@yafhoo.fr

Introduction

Carbohydrate homeostasis corresponds to the set of physiological, cellular, and molecular mechanisms that closely adjust blood glucose between 0.8 and 1.2 g/L (Semmani and Boughani, 2013). The body must then constantly manage these small variations in the concentration of blood glucose. This balance must be dynamic in order to allow precise regulation of energy homeostasis (Migrenne *et al.*, 2006). Thus, during a meal, the body must first be able to detect the entry of nutrients, then to integrate all the nutritional signals generated during the absorption of glucose in order to set up the cellular functions that will allow the use of this energy (Coget, 2008). In the post-absorptive period, during fasting, the entry of glucose into the body is zero. It is, therefore, the producing organs, such as the liver, intestine, and kidneys that ensure the flow of glucose to user tissues such as muscles and the brain (Semmani and Boughani, 2013). Indeed, a perfect glycemic balance in the preconception period as well as during pregnancy significantly reduces the risk of fetal malformations and maternal complications related to diabetes (Dubé, 2013).

Oral contraception is a molecule synthesized from the chemical substances hormones (estrogen and progesterone), used orally to act mainly by blocking ovulation and/or also modifying the endometrium so that it cannot accommodate a possible embryo and modifying the mucus to prevent sperm from passing through the cervix (Mimoun, 2011). Oral contraception is the main method used by women of childbearing potential who do not want a child (Petot, 2007). Indeed, these female sex hormones that pills sometimes contain strongly influence natural hormonal levels (Arcé, 2018). Thus, chronic administration of hormone therapy exerts favourable effects on carbohydrate homeostasis and body composition and improves insulin sensitivity (Espeland *et al.*, 1998). However, many questions remain about the metabolic risks of certain constituent molecules of oral contraception. The aim of this work is to evaluate the effects of pills on the blood sugar levels of students at the Public Universities of Côte d'Ivoire.

Materials and methods

Study population

The population studied consisted of female students from the six Public Universities of Côte d'Ivoire. Indeed, they are the Felix Houphouët Boigny University of Abidjan, the Nangui Abrogua University of Abidjan, the Jean Lorougnon Guedé University of Daloa, the University of Man, the Alassane Ouattara University of Bouaké and the Péléforon Gon Coulibaly University of Korhogo (Fig. 1).

Technical equipment

The technical equipment consisted of a "exacta" and "Deluxe" personal scale for age determination, a bique and lancets to prick the index finger of the disinfected left finger, a glucometer brand "on call plus" to measure blood glucose, gloves to avoid self-contamination, brand strips "on call plus" to collect blood, hydrophilic cotton and 90° alcohol to disinfect the finger and a questionnaire sheet for the data collection.

Size of the population studied

The study was carried out in the six Public Universities of Côte d'Ivoire. A total of 1485 students were randomly selected, of which 400 students are from Felix Houphouët Boigny University, 243 girls from Nangui Abrogoua University and 211 of them were from Jean Lorougnon Guédé University. Those from the University of Man numbered 57 people and the students from the Universities Alassane Ouattara and Péléforon Gon were respectively 343 and 231.

Inclusion criteria

All fasting students were included in this study; all students at least 18 years of age.

Non-inclusion criteria

All pregnant students were excluded from this study, all students who are breastfeeding a child under 7 months of age.

Study period

The study itself consisted of interview sessions with the selected students and took place over a period of

10 months, from February 2019 to December 2019.

Measuring the age of each student
This parameter was made from Monday to Saturday between 6 AM and 11 h 45 min and was determined using the "exalta" scale. After pressing the scale ignition button, the reference value 00:00 is displayed on the screen. Following the display of this value, each student was mounted on the scale barefoot and remained motionless for 10 seconds and then the age value is displayed.

However, each student mentioned their age on the survey sheets for further confirmation.

Fig. 1. Location of the six Public Universities of Côte d'Ivoire.

Determination of the blood glucose of each student
A blood sample was also taken from Monday to Saturday between 6 AM and 11:45 AM on each student. To do this, a lancet was opened first by making two rotations at its closure clockwise to expose the needle. Once discovered, it was placed inside the pen. The students' index finger was later disinfected with cotton soaked in alcohol. The pen hole was moved closer to the disinfected finger to prick it. The pressure was then exerted on this finger to collect a drop of blood on a strip previously attached to the glucometer for the determination of blood glucose. After displaying the blood glucose value on the screen of the blood glucose meter, a cotton pad soaked in alcohol was placed on the finger to stop the flow of blood.

Blood glucose values define the following states: blood sugar less than 0.8 g / L indicates hypoglycemia ; blycémie comprise entre 0,8 g/L et 1,2g/L évoque une glycémie normale ; Blood sugar greater than 1.2 g / L describes hyperglycemia.

Collette and data analysis
After taking age and blood glucose levels, survey sheets were distributed and collected the same day after they were filled. The data collected was analyzed and analyzed using graph pad prise7 software

(Microsoft, USA), SPSS software and EXCEL Spreadsheet 2013. Data were assessed using Student's T-test when it came to two variables and the one-way ANOVA method when it came to variables greater than 2, followed by Tukey's multiple comparison test at the 5% threshold to assess the significance of the observed differences. The correlation test is at the 1% threshold. The difference between the values was considered significant for a p-value < 0.05 and there is a correlation between values when the Pearson correlation < 0.01.

Results

Different methods of contraception sampled in Universities

The study showed that, in general, several methods of contraception were used in the student environment, namely oral contraception or pills, IUDs, condoms, leaves, fruits and other contraceptive methods (natural methods and abstinence). Pills were the most widely used method with a rate of 70.44% and IUDs were used less with a rate of 1.15% in general (Table 1).

Table 1. Types of contraception by Universities.

		Percentages						
		Name of Universities						Total
		UFHB	UNA	UJLOG	UM	AO	UPGC	
Name of contraceptives	Pills	78,50	66,11	76,19	36,19	70,98	63,20	70,44
	Iud	3,25	0	0,83	0	0,29	0,87	1,15
	Condoms	6,50	9,62	7,62	28,07	8,05	9,52	8,21
	Leaves	3,25	7,11	2,38	19,30	7,47	6,06	5,86
	fruit	2,75	0,84	0	0	0,57	1,13	1,21
	Other	5,75	16,32	12,98	15,79	12,64	19,22	12,59
Total		26,94	16,36	14,21	0,83	0	0,29	0,87

UFHB : Université Félix Houphouët Boigny ; UNA : Université Nangui Abrogoua ; UJLoG : Université Jean Lorougnon Guédé ; UM : Université de Man ; UAO : Université Alassane Ouattara ; UPGC : Université Péléforon Gon Coulibaly.

At the Félix Houphouët Boigny University in Abidjan, pills were the most widely used contraception at 78.5% and fruits were less used at 2.75%.At Nangui Abrogoua University in Abidjan, pills were the most widely used method with a rate of 66.11%, fruits were the least practiced method at 0.84% and no student surveyed used IUDs. At the Jean Lorougnon Guédé University in Daloa, pills were the most widely used contraceptive method, with a rate of 76.19%, IUDs were the least practiced method at 0.83% and no student surveyed at this University used fruit as a method of contraception.

Table 2. Age range by type of oral contraception.

		Percentages					
		Name of the pills					Total
		Pregnon	Levo-BD	Norlevo	Confiance	Stediril	
Age	≤19 ans	3,27	0,00	0,00	0,00	0,00	1,91
	[20 ans- 24 ans]	77,78	55,77	64,58	36,11	40,43	63,29
	[25 ans - 29 ans]	14,71	49,23	31,25	37,78	43,97	25,53
	[30 ans - 34 ans]	3,43	0,00	4,17	24,44	12,77	8,13
	.≥ 35	0,81	0,00	0,00	1,67	2,83	1,14
Total		58,57	4,59		17,21	13,48	

At the University of Man, pills were the most widely used contraceptive method with a rate of 36.19%, and plants were the least practiced method at 19.39%. No student at this institution used IUDs and fruits as a contraceptive method. At Alassane Ouattara University in Bouaké, pills were the most used, with a

percentage of 70.98% and IUDs were the least used with a percentage of 0.29%.

At the Péléforon Gon Coulibaly University in Korhogo, pills were the most used by female students, with 63.20% IUDs using the least and 0.87%.
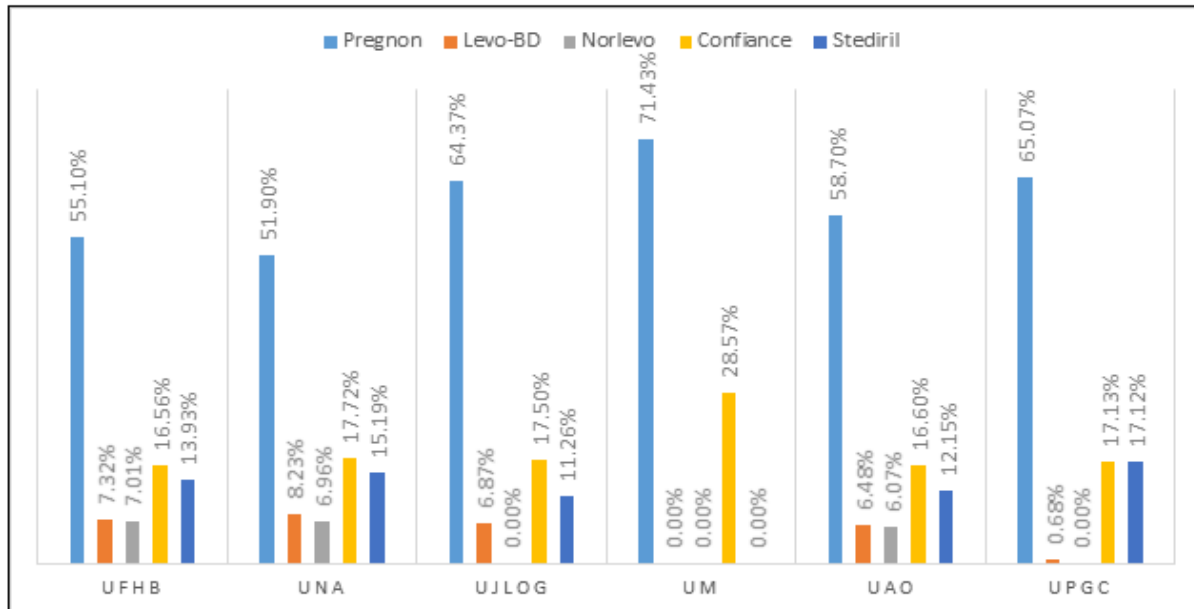

Fig. 2. Pills sampled by University.

UFHB : Université Félix Houphouët Boigny ; UNA : Université Nangui Abrogoua ; UJLoG : Université Jean Lorougnon Guédé ; UM : Université de Man ; UAO : Université Alassane Ouattara ; UPGC : Université Péléforon Gon Coulibaly.

Different oral contraceptives sampled in Universities
In general, two groups of pills were sampled in all public universities in Côte d'Ivoire, namely morning-after pills or emergency contraception (Pregnon, Levo-BD and Norlevo) and daily pills (Confiance and Stédiril). Of these pills, Pregnon was the most used pill at 58.51% and Norlevo was the least used pill at 4.59% (Fig. 2).

At Felix Houphouët Boigny University, Pregnon was the most common pill used by female students, with a percentage of 55.10% and Norlevo was the least used pill at 7.01%.

At Nangui Abrogoua University, Pregnon was the most widely used pill by female students, with a percentage of 51.90% and Norlevo was the least used pill at 6.96%.

At the Jean Lorougnon Guédé University, Pregnon was the pill most practiced by female students, with a percentage of 64.37% and Levo-BD was the least used pill or 6.87%. No student of this institution used Norlevo.

At the University of Man, Pregnon was the most widely used pill by female students, at 71.43% and Confiance was the least used pill at 28.57%. No student of this Institution used Norlevo, Levo-BD and Stédiril.

At Alassane Ouattara University, Pregnon was the most practiced pill by female students, with a percentage of 58.70% and Norlevo was the least used pill or 6.07%.

At the University Péléforon Gon Coulibaly, Pregnon

was the most used pill by female students, with a percentage of 65.07% and Levo-BD was the least used pill or 0.68%. No student of this institution used

Norlevo. Statistical analysis of the data had shown that there was no correlation between oral contraceptive use and institutions (0.35 > 0.01).
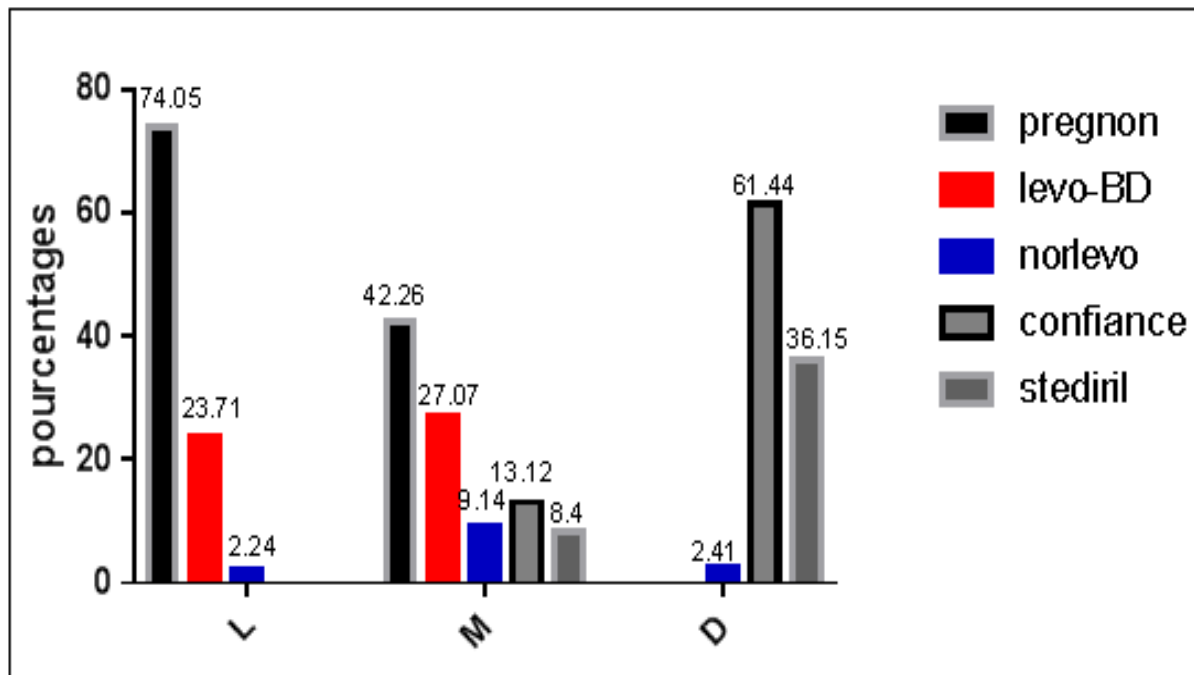

Fig. 3. Level of study by types of pills sampled.

L : License ; M : Master ; D : Doctorate.

Study of the age group by type of oral contraception
The average age of oral contraceptive users was 23.91 ± 0.86 years, with a minimum of 18 years and a maximum of 36 years. Pregnon was the most widely used oral contraception by female students between the ages of 20 and 24, or 77.78%, and the least used by female students who were 35 years of age or older, or 0.81%. Levo-BD was used only by female students who were between the ages of 20 and 24, and the ages between 25 and 29 were 55.77% and 49.23%, respectively. Norlevo was used by the majority of female students between the ages of 20 and 24 or 64.58% and used by the minority of female students who were between 30 and 34 years of age or 4.17%. No student who was 19 years old or younger and 35 years old or older used Norlevo. Thirty-seven decimal seventy-eight percent of female students between the ages of 25 and 29 used Trust more and 1.67% of female students who were 35 years of age or older used Confidence less. Stédiril was more used by female students who were between the ages of 25 and 29 or 43.97% and less used by female students who

were 35 years of age or older or 1.67%. Stediril was not used by female students who were 19 years of age or younger (Table 2). Statistical analysis had shown that there is a correlation between age and pill use (0.00 < 0.01) and the strength of this relationship is weak because the Pearson correlation is 0.389** or 38.90**%.

Study of the level of study according to the types of oral contraception
The majority of License's students used Pregnon (74.05%), unlike Norlevo (23.71%) and no student used Confiance or Stédiril. Master's students used Pregnon more at 42.26% and used Stédiril less at 8.40%. A large number of Doctorate students used Confiance (61.44%), a small number used Norlevo (2.41%) and no female students at this level used Pregnon and Levo-BD (Fig. 3).

The study had shown that there is a correlation between the level of study and the use of pills (0.00 < 0.01) and the strength of this relationship is weak
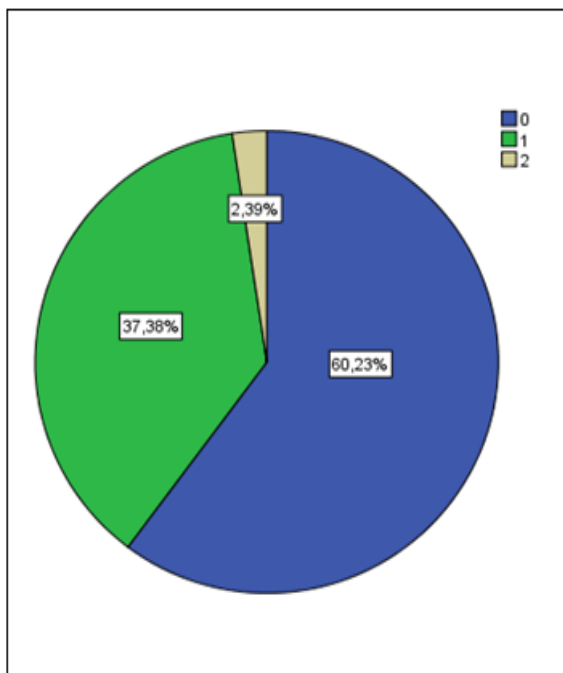
because the Pearson correlation is 0.358** or 35.80**%.

Fig. 4. Distribution of pill users according to the number of children.

Study of the number of children by type of oral contraception

In general, 60.23% of the female students surveyed had no children yet, 37.38% had one child and 2.39% had two children (Fig. 4). Among those who did not have children, the majority used Pregnon or 74.44% and the minority used Confiance or 4.32%. As for those who had a child, 44.80% used Pregnon and 0.49% used Norlevo. Of those with two children, 83.33% used Confiance, 16.67% used Stédiril and no students used Pregnon, Levo-B and Norlevo (Fig. 5). The study had shown that there is a correlation between the number of children and the use of oral contraception (0.00 < 0.01) and the strength of this relationship is weak because the Pearson correlation is 0.318** or 31.8**%.

The physiological study between blood glucose and oral contraception

The average blood glucose level of female oral contraceptive users was 0.93 ± 0.51 g/l. The blood glucose levels of all students who used the contraceptive pills ranged from 0.8 g/l to 1.2 g/l (Fig. 6).

Discussion

Among the different methods of contraception sampled in universities, pills or oral contraception were the most used method at 70.44%. The work of some authors had shown that 72% of women on contraception were on pills (Moreau, 2009). However, the results of some authors had shown that 10% of women take the pills (Joyeux and Vialard, 2013). IUD was the least used method at 1.15%, this result is similar to that of Bajos *et al.* (2002). These authors had obtained that the IUD was used at 1%. This same result differs from that obtained by other authors who had shown that the IUD was used at 38% in Germany and about 60% in France (Joyeux et vialard, 2013).The study of oral contraception by Universities had shown that oral contraception was the most practiced method in each University. This result corroborates that obtained by Peyrot (2014). According to this author, the distribution of pill users by level of study (BEPC, CAP, BEP, BAC Professionnel, BAC Général and Les Etudes Supérieures) had shown that pills were more used by those who were in higher education. This high rate of contraceptive use could be explained by the fact that the students had enough information about these contraceptives. The lack of information on hormonal contraception represents an essential obstacle, a situation of fragility to their use (High Authority of Health, 2013).

The study of sampled oral contraception had shown that Pregnon was the most used contraception with a rate of 58.51% and Norlevo was the least used pill or 4.59%. These results were different from those of Marquet (2014). The results of this author had revealed that the most taken pill is LEELOO Gé; it represents 37.5% of the pills taken alone, clearly ahead of MINIDRIL (58%). This study also showed that pregnon emergency contraception was the most used in all institutions. This could be explained by the fact that the population studied was very young. A study of a population of 1,599 adult, youth and adolescent women confirmed that emergency contraceptives were most commonly used by young people and adolescent girls (Fisher *et al.*, 1998).
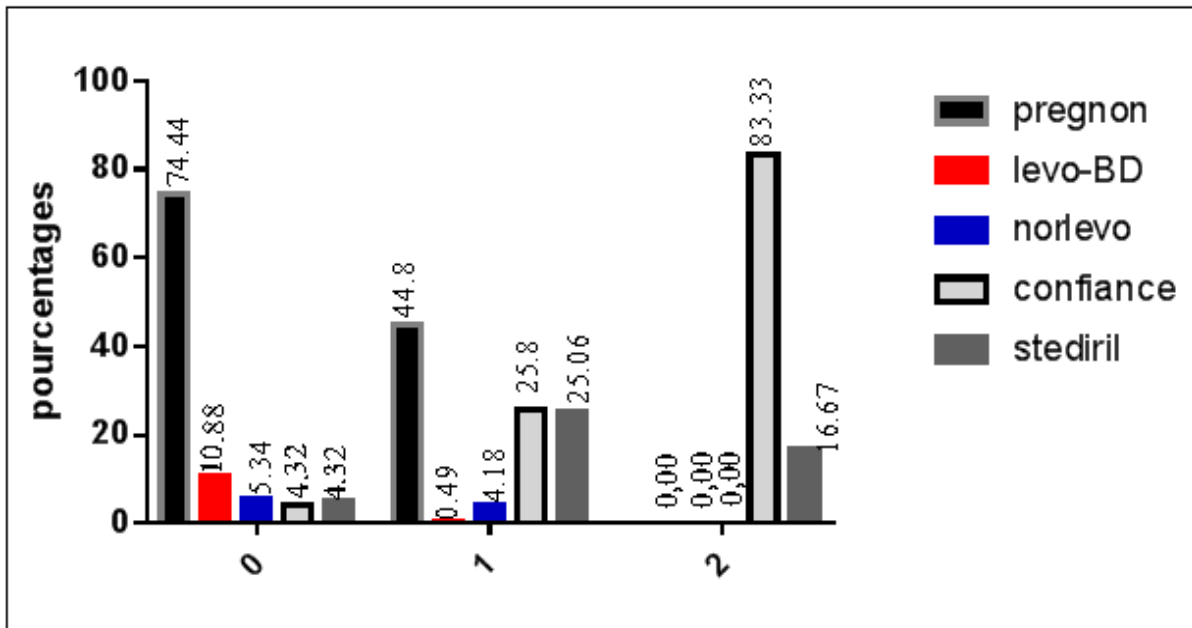
Fig. 5. Number of children by pill types sampled.

The study of age and oral contraception had shown that emergency contraception (Pregnon, Levo-BD and Norlevo) was more used by students who were less than or equal to 19 years old and between 19 years and 29 years old while daily contraception (Confiance and Stediril) were more used by students who were between 20 and 34 years old. This preference could be due to the degree of the relationship between the partners. Condoms and emergency contraception are the reference methods at the beginning of sexual life; then, when relations stabilize, it is the use of daily pills; finally, when the woman has had children, she can use the IUD (Bajos *et al.,* 2004). The study of the level of study and oral contraception had shown that Pregnon was the most used emergency contraception by Bachelor's and Master's students, while Confiance was daily contraception was the most used daily contraception by Doctoral students.
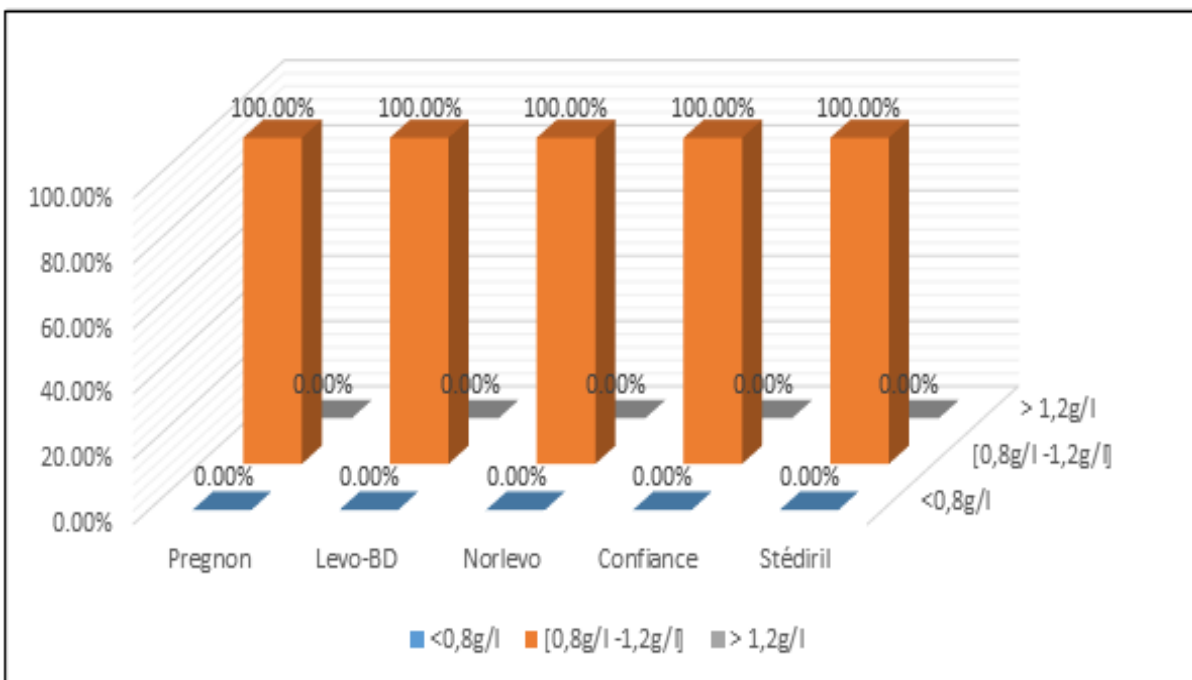

Fig. 6. Blood glucose by type of oral contraception.

This preference could be explained by the lack of financial means because Pregnon is the cheapest emergency pill and Confiance is the least expensive daily pill. The work of some authors stipulated that young people who live love, use the cheaper pills (Leal, 2011). The study of the number of children and the use of oral contraception had shown that emergency contraception was more used by female students who did not have children, while daily contraception was more used by female students who had two children. This could be explained by the fact that some methods are valued according to the phases of sexual life. Studies conducted by some professionals restrict the contraception of nulliparous people to the use of the morning-after pill (High Authority of Health, 2012).

The blood glucose study had shown that students on oral contraception had a normal blood glucose level, i.e., between 0.8 g/l and 1.2 g/l. This result could be explained by the fact that certain constituent molecules of these contraceptives have a beneficial effect on the regulation of blood sugar. Estrogen deficiency leads to the early onset of overweight, insulin resistance and dyslipidemia (Faustini-Fustini *et al.*, 1999) and (Heine *et al.,* 2000). Other authors suggest that chronic administration of hormone therapy exerts favorable effects on carbohydrate homeostasis and body composition, and improves insulin sensitivity, based on the fasting insulin values (Espeland *et al.,* 1998). Estrogen administration resulted in a 21% to 35% reduction in the incidence of diabetes in women on treatment (Bonds, 2006).

Conclusion

This study allowed us to remember that the student environment is made up of a very young population that uses oral contraception. Pregnon (morning after pill) was the most used pill, unlike Stediril (daily pill). Female students between the ages of 18 and 29 used emergency contraception more, while those who were 30 years of age or older used daily contraception more. Most of those who were in Bachelor's and Master's degrees used emergency contraception more and they did not yet have children. As for those who

were in Doctorate, most used daily contraception and most had two children. The constituent molecules of the pills had a beneficial effect on glycemic regulation.

References

Arcé C. 2018. Contraception: no, the pill does not make you fat but changes the shape of the body. Istock **12(3),** 217–223.

Bonds DE, Lasser ML, Qi R, Brzyski B, Caan G, Heiss MC. Limacher JH, Liu E, Mason A, Oberman MJ, O'Sullivan LS, Phillips RJ, Prineas, Tinker L. 2006. "The effect of conjugated equine oestrogen on diabetes incidence: the Women's Health Initiative randomised trial." Diabetologia **49(3),** 459-468.

Bajos N, Oustry P, Bouyer J, Job-Spira N, Hassoun D et Cocon E. 2004. Social inequalities in access to contraception in France. Population, National Institute of Students for Development **59(3),** 479-502.

Bajos N, Bohet A, Le Guen M, Moreau C, Fecond E. 2002. Contraception in France: new context, new practices? Population and Societies, p 492.

Coget J, 2008. Regulation of blood glucose. Thesis submitted for obtaining a doctorate in Biological Science at the University Center for Estrogen and Progesterone - University of Saint Teresa of Lorenne, p 156.

Dubé CU. 2013. Effects of a dairy derivative on insulin resistance. Thesis submitted for a master's degree in science of physical activity at the Université du Québec à Trois-Rivières, p 80.

Espeland MA, Hogan PE, Fineberg SE, Howard G, Schrott V, Waclawiw MA, Bush TL. 1998." Effect of post-menopausal hormonal treatment in insulin and glucose concentration. Investigators. Postmenopausal Estrogen/Progestin Interventions." Diabetes Care **21(10),** 1589-1595.

Fisher CR, Graves KH, Parlow AF, Simpson ER. 1998. "Characterization of mice deficient in aromatase (ArKO) because of targeted disruption of

the cyp19 gene." National Academic Production of Science United State of America **95(12),** 6965-6970.

Faustini-Fustini M, Rochira V. and Carani C. 1999. "Déficience en œstrogène chez les humains : où sommes-nous aujourd'hui?" Europe journal of Endocrinol **140(2),** 111-129.

High Authority of Health. 2012. Oestroprogestative oral contraceptives: prefer 1st and 2nd generation pills [online]. November 2012 (accessed 11/2013): Available at: http://www.hassante.fr/portail/upload/docs/applicat ion/pdf/201212/contraceptis_oraux_3_g_fiche_bum .pdf.

In **Savio M.** 2015. The different oral contraceptives: their prescription, their use, their risks of use, evolution of knowledge and consequences in terms of prescription and use.

High Authority of Health. 2013. "State of play of contraceptive practices and obstacles to access to and choice of appropriate contraception". www.has-sante.fr - Available at http://www.has-sante.fr/portail/upload/docs/application/pdf/2013 05/contraception_freins_reco2clics-5.pdf (accessed October 12, 2014). *In* Daccord L. 2015. Nulliparous contraception seen by doctors. Thesis present for the obtaining of a State Diploma of Midwife in Pharmacy University of Limoges, p 108.

Heine PA, Taylor JA, Iwamoto GA, Lubahn DB, Cooke PS. 2000. "Increasedadipose tissue in male and female estrogen receptor-alpha knockout mice." National Academic Production of Science United State of America **97(23),** 12729-12734.

Joyeux H, Vialard D. 2013**.** The truth is that the truth has been hidden from you for 50 years! Excerpts from the book published by Editions du Rocher, p 43.

Leal K. 2011. State of play of the practice of gynecology-obstetrics by general practitioners of Ile de France. Contraception **77(4),** 249 – 256.

Mimoun KS. 2011. Contraception and sexuality. Contraception. 4th ed. Elsevier Masson, **37,** 456-465.

Marquet D. 2014. Oral contraception and adherence: what do patients take away from consultations? Thesis presented for the obtaining of the title doctor in Medicine at the University Claude Bernard Lyon, 177.

Moreau C. 2009. Epidemiological data on contraception in France. Reflections in Gynecology-Obstetrics, **(2),** 131-133.

Migrenne S, Marsollier N, Cruciani-Guglielmacci C, Magnan. C. 2006. Importance of the gutbrain axis in the control of glucose homeostasis. Curr Opin Pharmacol **(6),** 592-597.

Petot H. 2007**.** Long-term effects of pre-pubertal physical activity on bone density in adults. Dissertation presented for a Master's degree at the Université du Québec à Trois-Rivières, p 64**.**

Peyrot L. 2014**.** Controversy over 3rd and 4th generation pills: what impact on women and their contraception? Descriptive survey of 156 patients from the Tarn. Thesis presented for the title of State Doctorate in Medicine at the Limoges University of the Faculty of Medicine, p 100.

Semmani N, Boughani S. 2013. . Effect of insulin on glucose uptake by human sperm and red blood cells. End-of-cycle dissertation presented for a Master's degree in Animal Reproduction and Biotechnology at the Abderrahmane Mira University of Bejaïa of Algeria, p 69.