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THE LEVEL OF PARTICIPATION OF POLYGYNISTS IN THE AFRICA GOSPEL CHURCH AS EXAMINED IN KERICHO COUNTY KENYA

By

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Abstract

This paper focuses on polygynists as members of the Africa Gospel Church of Kericho County of Kenya. The fact that these members are present in this church, their participation in the church activities has not been fully allowed. Since the Africa Gospel Church prefer monogamists over polygynists in the area of participation and leadership, a study was carried out among respondents who are members of this Church with relative knowledge on the subject area to determine their level of participation. It was realized that this church distinguish participation in terms of roles as minor, major and disputed roles where minor roles are preferred for polygynists while major roles are not preferred for them. Disputed roles were found to fit both monogamists and polygynists. The findings are therefore important for Africa Gospel Church in improvement of her view regarding polygynists in terms of membership and participation.

Key Words

Africa Gospel Church (AGC): One of the evangelical denominations in Kenya.

Monogamist: It refers to a man who is married to two or more wives at the same time.

Participation: It refers to the freedom to be involved in church activities freely as a member of AGC. It includes the freedom to participate in those activities without denial.

Polygynist: It It is used in this study to mean the people who are advocated for in the study to be involved fully in church activities in AGC Kericho County.

Polygyny: It refers to a marriage where a man has more than one wife at the same time. It is used in this study to mean the marriages of the polygynists

1.0 Introduction

Marriage being one of the sacraments of the church has been found to be with issues when it comes to the types and practicability. With the different types of marriages, the Bible in the creation account presents one man for one woman which favours monogamy other than polygyny as the ideal type. In the attempt to understand marriage, polygyny has proved to be the most challenging type that the church has to deal with in matters of involving the members in church activities when the polygynists are present.

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Globally, polygyny has become an issue for a long time. The Anglican Church and other Protestant churches have struggled to understand this system of marriage and how to handle it (Eugene, 1982). The Anabaptists in 1531 at Munster openly preached that he who wants to be a true Christian must have several wives. And the Mormons, as all the world knows regard polygamy as a divine institution (Aguedze, 1990). The followers of The Church of Jesus Christ of Latter-days Saints believe that polygyny is ordained by God (Hughes, 1965). A visiting professor to Vietnam after spending several years there mentioned that there were various reviews and questions concerning polygyny since that country have been culturally and traditionally polygynous (Urrutia, 1981)

This issue is not unique to Africa as professor Hillman (1982a) also commented that monogamy is indeed hard to make obsolete in Africa because polygyny has deep roots and modifying African customs is ambiguous. According to a statistics done in Chad (Christianity Today, 2012), it was found that forty eight percent of Christians practice polygyny. In Kenya, the issue of polygyny has roots according to the latest official statistics on population trends done generally where thirteen of every 100 married Kenyan women have co-wives (Daily Nation 2012). When the Kenyan constitution was being drafted, the Kenyan church leaders rejected the section on polygyny that was to be debated in the parliament and which would authorize polygynous marriages by stating that marriages should follow the biblical way (Christian Telegraph, 2012). However, the current constitution in chapter four part forty-five in the section of family (Constitution of Kenya, 2010), recognizes marriages conducted under any tradition, system of religion, personal or family law. The Anglican Church for example, had a rule of not involving polygynists in the participation of baptism, but upholding monogamy as the ideal form of marriage (Sentinel, 2012).

AGC has been dealing with this issue since its foundation. The first constitution stated that this Church does not recognize polygynous marriages while the current one does not approve it either (Draft Constitution, 2012). The first missionaries and church elders in 1963 struggled a lot with this issue as the church was being organized (Steury, 1997). The first constitution of the AGC drafted in 1963 before being amended stated that a polygynous man would not be baptized unless he leaves his second or other wives and sticks to the first one. This tough condition led to a lot of frictions because a member who has not been baptized was not allowed to participate freely and fully. After amendments of the constitution when polygynists were allowed to be baptized, there still was a challenge on kinds of roles they can participate in and therefore this paper seeks to their level of participation.

2.0 Methodology

The study used the descriptive type of research design with collects information using interviews or administering of questionnaires to a sample of individuals (Kombo, 2006) Descriptive design was ideal for this study because it gathers information about people's attitudes, opinions, habits or social issues. People's opinions about participation of polygynists in the church were collected. The respondents were sampled purposively through non-probability sampling then placed in four categories as follows; category "A" for Ordained Ministers, category "B" for Licensed Pastors, category "C" for Missionaries and category "D" for Polygynists. Category A respondents were the main decision makers of the church referred as reverends after being ordained and they are entitled to baptize, officiate weddings, conduct burial services, dedicate children and can attend the Central Church Council (National Church Council) among other priestly roles. Most of them are given to oversee several churches grouped together in a given geographical location referred to as Area after serving for a period not less than ten years.

Category B was made up of pastors who serve as overseers of local churches while some work in respective church offices. Their time of service in the church may not be less than five years and they should have gone through theological training either formally or non-formally by Theological Education by Extension (TEE).

They are in charge of the every day's activities going on in the local church, can dedicate children, baptize and administer Holy Communion. Category C on the other hand was made up of missionaries working directly in the mission places or those working within the Mission department of the AGC. They often get in touch with planting of new churches in new places and are exposed to an unreached people groups. AGC being a missional church emphasizes on evangelization to the lost and establishment of churches as some of its strategic objectives. In order to attain these objectives, mission department play a key role in this since it is the link to mission fields. Other departments get involved by supporting those in the mission fields financially, materially or by sending human resource.

Category D formed the largest population sample advocating for participation of polygynists. Their contribution in the church has been minimal because of the requirements stipulated in the constitution and the treatment they receive from fellow members. Most AGC members understand the background of these people by the fact that most of the families found within the communities where this church is found are products of polygynous marriages either directly or indirectly. Some of the members are children from such families or their parents were born from polygynous marriages. Majority of the earlier church converts were either polygynous, wives of polygynous men or children from such families. The total number of respondents per category varied depending on the number of those respondents in the church and the nature of the study as presented in the table below.

Table 1:
Total respondents per category.

Respondents	**Category**	**Percentage**
Ordained Ministers	A	8.34
Licensed Pastors	B	14.58
Missionaries	C	14.58
Polygynists	D	62.5
Total	_	**100**

3.0 Results and Discussion

Upon collection of the data, the obtained information was analyzed into appropriate themes in each category. This was because the information gathered from every category was different from the other. The data were also organized in such a way that it reflected the objective of the study and it was presented below.

3.1 Polygyny in the AGC

Upon collection of the data, it was realized that polygyny exists in the AGC as one of the types of marriages which is recognized but not approved. It has been an issue in the involvement of polygynists in church activities which conquers with what Harries says as an experience during Lambert conference (Harries, 1997), "At the Lambert Conference of 1888, the committee of polygamy after formulating rules of conduct, affirmed that they are of the opinion that it is not possible to lay down a precise rule to be observed under all circumstances in dealing with the change from polygamy to monogamy."

3.2 Polygyny and Participation in Mission Fields

The respondents in category C who work with the mission department of AGC reacted to the question of polygynist's presence in the mission fields. It was found out that there are more polygynous than monogamous men in the mission fields. This is a challenge being a cultural practice where in most cases there are more polygynists who are converted than monogamists. It is also a challenge when viewed against biblical principles, which emphasises on monogamy and lastly it is a challenge constitutionally by the fact that the

AGC's constitution does not approve polygyny. The overall challenge is on how to balance between the cultural view, the biblical position and the constitutional position. Letting them to understand the different positions is not an easy task also as expressed by one of the respondents.

In the area of involving the polygynists in church activities during the service, the presence of more polygynists than monogamists means that the polygynists will have to assist in some of the church activities. It was also mentioned that when a community shifts to a new place, the local people may establish a new church and run it by themselves. That by default leads to polygynists being involved. The findings showed that the polygynists view themselves as better than monogamists in the area of management and leadership. The respect they are shown in the community because of their status makes them feel they are in a capacity to handle church matters. Being polygynous was a status admired in the society and anyone in that status was regarded as able to handle many of other duties since there is an evidence of a well managed home already.

3.3 Church Service participation of polygynists

In responding to the question of polygynist's contribution to the church, the respondents agreed that polygynists could contribute to the church spiritually and materially. No respondent had any problem with any material contribution by polygynists. All of them said that polygynists should contribute materially by giving to the church. Material contribution here include tithes giving, giving of offerings, giving, giving for compassion purposes and any other well-wished donation that can be financial or in-kind support. The material contribution is geared towards church developments, projects and support for those in-needs. The *s*piritual contribution, involves participating in activities like preaching, teaching, sharing of testimonies, leading of services and offering prayers. Spiritual activities were questionable when the respondents gave their views unlike material contribution, which had no questions.

The respondents based their support on this section of the constitution that polygynists should never be allowed to lead in any role. However, non-leadership roles were mentioned as fit for polygynists as those roles were considered as of less magnitude than the leadership roles. The following non-leadership roles were mentioned; helping the needy, giving, attending functions, visitations, singing, attending church services, giving of tithes and offerings, church projects, counselling and ushering. The study found out that the polygynists can contribute to the church materially and spiritually. Their contribution will be based on the roles they are permitted to play. This conquers with Kapolyo's view that, "The church should not be like a bus or an aeroplane where the majority of people have come along simply for the ride. Rather it should be like a beehive where everyone has a significant role to play (Kapolyo, 2005).

Different names were used to describe the types of roles. The researcher preferred to use the names major and minor, to represent leadership and non-leadership roles respectively in the following explanation. The division of major and minor roles based on the explanations mentioned by different respondents they are presented in the table below.

Table 2:
Major and minor roles.

No	Major roles	Minor roles
1	Preaching	Singing
2	Teaching	Testimony sharing
3	Pastoring	Church projects overseeing
4	Intercessory prayers	Baptism
5	Lay leading	Child dedication
6	Catechism class teaching	Partaking of Holy Communion

7	Departmental heading	Ushering
8	Leading service program	Playing musical instruments
9	Leading choir and music	Singing in choir
10	Sunday School teaching	Church cleaning
11	Church Council membership	Financial contribution
12	Church treasurer	Organization of church weddings and other functions

The total mentioned roles were twenty-four and twelve of them belonged to minor while twelve belonged to major category. A monogamous member was said to be free to participate in any of all the twenty-four roles but a polygynous person is limited to the in twelve minor ones only. There were varied views concerning some of the roles whether they were major or minor. There was a concern if there was any problem when a polygynist could participate in these roles. These roles became disputed when the respondents tried to apply the AGC's constitution and when they imagined what God would say when a polygynist participate in them. Some respondents believed that God uses weak vessels and any other person regardless of their social background and therefore these disputed roles can fall in either category. The disputed roles seem to be denied by the constitution but nobody knows what God would say when a polygynist participates in them and the following table presents the combined roles.

Table 3:
Combined table of the different types of roles.

No	Major roles	Disputed roles	Minor roles
1	Pastoring	Preaching	Singing
2	Lay leading	Teaching	Testimony sharing
3	Catechism	Intercessory prayers	Church projects overseeing
4	Leading service program	Departmental heading	Baptism
5	Sunday school teaching	Leading choir and music	Child dedication
6		Church council membership	Partaking of Holy Communion
7		Church treasurer	Ushering
8			Playing musical instruments
9			Singing in choir
10			Church cleaning
11			Financial contribution
12			Organization of church weddings and other functions

After dividing the roles into three types, five remained as major roles meant to be for monogamous members, seven were disputed while twelve were termed as minor, and polygynists could freely participates in them. The study found out that the constitution of AGC was not specific on which roles are for people like polygynists. It was also found out that when the disputed roles are added with the minor roles for polygynists, it will boost their number of roles

4.0 Conclusion and Recommendation

Some critical findings were realised during the study of the level of participation of polygynists in Kericho County. The study found that in AGC Kericho County, the church affirms monogamy as the ideal form of marriage ordained by God and that polygyny has existed in this church since when it was founded. It also found out that the polygynists contribution to the church are welcomed though they are limited to non-leadership roles alone. Several roles were mentioned which polygynists can participate in broadly referred as major and minor roles. The recommendations reached were as follows;

1. **The Church Constitution:** It has appeared in several inputs that the AGC members are good adherents of the church's constitution. All the respondents in their respective categories respected this constitution and no one had a thought of going against it. However, they were concerned of any amendments that may be necessary to be made. The old one was amended which was tougher for the polygynists and which was not accommodating them for baptism and membership. It was amended to allow their baptism as well as their membership. It is clear that the polygynists are denied leadership roles but non-leadership roles are not clearly indicated. Many respondents tried to guess that non-leadership roles might be those, which will not involve leading, but still that was not sure. It is recommended here then that the current constitution be adjusted to make specific some roles especially non-leadership roles for polygynists.

2. **Trainings and Seminars:** In order to allow improved participation of polygynists, trainings and seminars should be held, relevant to address issues of church participation.

3. **Accountability on the use of gifts and talents**: It was realized from the study that polygynists may not use their gifts or talents well. The conditions laid for them and the culture that they were required to be members who should just attend and remain passive during service or in other times has limited their chances of using their gifts and talents.

4. **Outcome of polygynists' participation:** If polygynists are really considered and allowed to fully and freely participate in their respective roles, what will be the outcome of that in several years to come? A study has to be done on this to see if that may encourage the practice or not.

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BUILDING COLLAPSE: CAUSES AND POLICY DIRECTION IN NIGERIA

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ABSTRACT

Building Collapse is an occurrence that has been notorious over the decades. It is caused by many factors which have their great impact on lives and properties of man. This study review current challenges in the building industry globally, highlighted human causalities from reported cases of building collapse in Nigeria cities between 2000 till 2015. The paper also place emphasis on reviews of Government policies.

Key words: building collapse, global overview, policy direction

INTRODUCTION

According to encyclopedia Britannica, (2004), building can be defined as a roofed and walled structures built for permanent use for man's living, working and storage. Buildings are structures, which serve as shelters for man, his properties and activities as quoted by Ayedun et al, 2012 in Umeora C. O (2013). To obtain the desired satisfaction, they must be properly designed, well planned, constructed and maintained.

Failure in building can be defined as the incapability of the building components not being sufficient to perform what are normally expected of those components. Building failure is a common phenomenon all over the world but more rampant and devastating in the developing countries like Nigeria. The rate at which building collapse in Nigeria has reached a worrisome level in view of its alarming loses in term of lives and properties. It has been the concern of numerous authors: Opara, P. (2006); Opara, P. N. (2007); Oyewande, B. (1992); Chinwokwu, G. (2000); Windapo, B. (2006); Weihen, S. (1999) to search for the causes of this monster in order to proffer adequate solution of prevention, mitigation or preparedness.

Each time a building collapses accusing fingers point at major industry stakeholders that ought to hitherto play both statutory and supervisory role before, during and after erection of a structure. These stakeholders include structural and Civil Engineers, Building Contractors, and Valuers, Architects, Town Planners, Quantity Surveyors and Lands Developers. Each of the categories of stakeholders and/or professional shares a peculiar blame in any incidence of building collapse depending on the nomenclature or causes.

However, building collapse is not only peculiar to Nigeria, it happens outside the country. Many lives were lost through sick buildings e.g. Tsunami disaster of December 26, 2004 (Tsunami, 2008) in Taiwo and Afolami (2011).The risk of a building collapsing increases when the proper review is not followed. This paper therefore reviews the causes of building collapse globally.

GLOBAL OVERVIEW OF BUILDING FAILURE

Building all over the world constitutes one of the most valuable assets of mankind. More so, while these buildings provide humanity with a great variety of accommodation in form of residence, churches, mosques, offices, schools, hospital etc, they also provide employment for the skilled and unskilled person Oke (2011).

Corbett (2015) reported that on 24th April 2013, an eight-story commercial building, Rana Plaza collapsed in Savar, a sub – district near Dhaka, the capital of Bangladesh. At least 547 people died and around 2500 were injured with many still missing. It is considered to be the deadliest garment factory

accident in history. It has been reported that the elected Mayor of the municipality has been suspended for alleged negligence in approving the design and layout of the building including the addition of three stories for the Rana plaza. However, he said that Bangladesh has about 4,000 garment factories and export clothes to leading Western retailers, and industry leaders hold great influence in the South Asian nation. Its garment industry was the third largest in the world in 2011, after china and Italy. The Bangladesh Garment Manufacturer and Exporters Association estimated the industry at $20billion-a-year and make up 80% of Bangladesh's total exports. Dhaka has become one of the world's most populous and fastest growing mega cities, driving up the price of land and straining the country's electrical, power and gas systems. The shortage of land and a propensity for flooding in Bangladesh has prompted many factory owners to build up, rather than out. Additional floors often are hastily added without reference to building codes and approvals. Many factory owners who couldn't afford to build new buildings because of high cost of land and limited access to utilities converted hundreds of residential and other buildings, into makeshift garment factories to keep up with the demand from Western retailers.

He went further that on 17th July, 1981, two suspended walkways through the lobby of the Hyatt Pegency Hotel in Kansas City, Missouri, U.S.A. collapsed, killing 114 and injuring 200 people. The collapse was due to late change in design, altering the method in which the rods supporting the walkways were connected to them and inadvertently doubling the forces on the connection. The failure highlighted the need for good communication between design engineers' and contractors, with checks on design changes. The failure is a standard case study on engineering courses around the world, and is used to teach the importance of ethic in engineering.

Mark Bediako reported in Daily Graphic Newspapers that between 2012 and 2014, Accra, the capital city of Ghana, officially recorded four major building collapses that claimed a total of 19 lives. The Melcom building collapse near Achimota in 2012 claimed 14 lives whereas the Grand view Hotel building collapse at Nii – Boi Town in2014 recorded four deaths. Two other buildings collapsed in 2014; the building near Akai House at Cantonments claimed one life while the central University hostel building collapse in Dawhenya recorded no deaths. Recently, there was another multi-storey building collapse in Cantonments that recorded three deaths. A critical review of these buildings showed that almost all buildings that collapsed within this period were privately owned properties.

Furthermore, the case of naval building, Abuja, Nigeria was examined by Fakere et al (2012) as quoted by Ebehikhalu and Dawam (2014). The collapse of the Naval building, a two storey building in Gwarimpa, Abuja occurred on Saturday, 28th January, 2012. It was reported that 15 people were busy on the site when the building collapsed; 2 died, 1 seriously injured and the others escaped with minor injuries. The building under investigation had been described by the FCDA (Federal Capital Development Authority) as precarious and had been marked for demolition before it eventually collapsed. However, this elicits the fact that the structure was defective, hence the need to investigate the factors responsible for this. A critical look at the debris reveals the structural weakness of the construction materials used. Sub-standard materials were used in the construction of the building, which includes the reinforcement bars, concrete mixture ratio etc. The mixture of the concrete was not distributed evenly. Therefore, it could be obtained that the workmanship during the construction of the collapsed building was poor. This as a matter of fact must also have contributed to the weak structural members such as columns, beams and slabs which led to the unsafe nature of the building.

CAUSES OF BUILDING FAILURE

Ayinnuola and Olalusi, (2004) cited in Babatunde and Opawole (2009) stated that in Nigeria, building failure is attributed to 50% design faults, 40% construction site fault and 10% product failure. Hall (1984) cited in Usman et al (2010) also attributed faulty design, faulty execution of work and use of faulty materials to be major causes of building failure. Yusuf (2006) as quoted by Ebehikhalu and Dawam (2014) classifies the causes as physical factors, ecological status of the site, composition of technical components, social factors, economic factors, engineering factors, human factors, government policies and political factors. Akinpelu (2002) said, the major causes of building collapse are environmental changes,

natural and manmade hazards, improper presentation and interpretation in the design. Emmanuel (2007) cited in Usman et al (2010) stated that due to geologic make up, some layers of soil are just not strong enough to carry the weight of a building. This is mainly applicable to the top layer of the soil which is not suitable for construction. If this factor is neglected and the building is constructed on the soil, differential settlement of the building starts and leads to cracking of the wall and continues to sink and this can be seen in many parts of Lagos.

Ayininula and Olalusi (2004) stated that the quality of blocks used in Nigerian building industry is a factor in building failure. For example, the nine inch 9" (230mm) hollow blocks used for the construction of external wall of a building are to support the weight of the decking and other floors above it in conjunction with column. The strength of the blocks depends on the ratio of cement to sand used for moulding them, the right proportion must be used to ensure that they are strong and durable. Due to its high demands in the building industry, the block industries in Nigeria have equally increased the quantity in the bid to get the most number of blocks per bag of cement; they use more sand than necessary which eventually results in moulding weak blocks.

Apart from negligence, many of our buildings have failed as a result of changes in temperature due to climate change. Ogunsemi (2002) remarked that a good building is not that which merely fulfills the purpose for which it is designed and erected but a building comely and able to withstand the onslaught of weather conditions. Adedoyin, (1983) and Olagunju (2002) as reported by Olagunju et al (2013) stated that most of the available building materials in the developing countries are not only flammable but also encouraging the spread of fire. This situation often make a little fire ignition to spread very fast into a large scale fire development in buildings. Fire when fully blown out, both the structure's reinforcements and concrete will be weakened. It is even worse, when the steel reinforcement are exposed to the naked fire, they may fail in the process to provide the necessary support for both the live and dead load. This event may lead to partial or total collapse of the building.

Most contractors like to cut corners by not using the specified materials adequately. The use of inferior materials and untested local building construction methods often leads to structural failure and eventual building collapse if not adequately checked. Olagunju, (2011) stated that buildings start to deteriorate from the time they are completed and from that time begin to need maintenance in order to keep them in good condition. Thus, the rate of building deteriorating depends largely on nature and manner of maintenance. Poor building maintenance can cause weakening of the building structure; most especially when unplanned maintenance type is the building maintenance culture of the building owner/user.

Uzokwe (2006) cited in Adeniran (2013) submitted that the cause of a building failure is almost always unique to the particular building in question. However, he advanced some general reasons why buildings may be susceptible to collapse which includes the quality of the blocks used, the quality of the concrete used, poor compaction and consolidation of foundation soil and weak soil. Obiechina (2005) pointed out that the various stakeholders in the building industry are responsible for building collapse. He categorized the stakeholders into government, developers, professionals, regulatory bodies and civil society and non-governmental organizations.

Adebajo (2005) summarized the causes of structural collapses and failures in Nigeria from a series of building collapse investigations by the Nigerian institute of structural Engineers as non adherence to the approval regulation, absence of the involvement of a professional structural engineer in one or more of the stages of the project execution, incompetent and low quality workmanship, lack of soil investigation and improper interpretation of site conditions, lack of professional site supervision, lack of knowledge of the guiding principles concerning construction of the proposed development, greed and the desires to maximize profit, excessively rushed construction, poor or inadequate form and false work, corner cutting by the client or the contractor, construction by all comers due to the perception of engineering projects as an easy access window to make quick money, unethical dealings between project promoters and the relevant planning authorities.

BUILDING COLLAPSE IN NIGERIA

In recent times, building collapse in Nigeria has been a source of concern to so many people particularly those associated with the building industry. This is so because there are so many cases of building collapse all over the world and particularly Nigeria. Most of these cases had resulted into colossal economic losses in terms of lives and property. Building collapse is
some of the cardinal issues which have created serious concern to all the professionals like Architects, Structural Engineers, and the Builders. The government also is worried about the frequency of collapse of buildings in Nigeria. However, Aderibigbe (2001) as quoted in Fakere et al (2012) admitted that the recurring event of collapse of building has forced some state governments to enforce and enact some laws recommending forfeiture of such buildings and prosecution of their owners. Table 1 shows some occurrences of building collapse in Nigeria from 2000's till date.

CONCLUSION AND POLICY DIRECTION

Collapsed of building is as a result of using sub-standard materials, adding load that differ from the original design and non-compliance on the professional ethics these and many more lead to destruction of lives in several forms and degrees of injuries, and also properties. This study has been able to review several causes of building failure in Nigeria. It has highlighted several case studies of building failure in Nigeria including casualties of those incidents.

In Nigeria, all the policy statements are good and well stated, but the implementation is poor. There is need for urgent review of these policies by government so that Nigeria can be a safe place to live in. This paper recommends that the policies should be reviewed and implemented but if otherwise not adhere to, should face the law.

Table 1: Building Collapse in Nigeria from 70's till Date.

S/N	Building location	Types of building structure	Date of Collapse	Suspected Cause (s)	Remarks (Lives lost)
1	Idi-Oro, Mushin, Lagos	Residential Storey building	2000	Faulty Design/Careless ness	Not available
2	Ajah along Lekki Rd, Lagos	Estate building	April, 2000	Structural failure	Nil
3	Oke Bola, Ado-Ekiti		2000	Poor quality control, rainstorm	Nil
4	Ogbagi Street, Ikare		2001	Fire disaster	Nil
5	Odo Ikoyi, Akure		2001	Foundation problem	Nil
6	21, Buhari Street, Mushin Lagos	2-Storey Mosque building	April 2001	Unauthorized conversion of former Bungalow to-Storey Building	7
7	Iwoye-Ijesa, Osun State	1-Storey Residential Building (under construction)	2001	Structural failure/use of quacks for supervision	7

8	Odoso Compound, Ikare		2002	Fire disaster	Nil
9	Ojuelegba, Akure		2003	Poor workmanship & under-reinforcement	Nil
10	Stadium Road, Akure		2003	No structural members	Nil
11	Onyearugbulem Market, Akure		2003	Poor workmanship & under-reinforcement of the cantilevering end	Nil
12	Ebute Meta		2003	Structural defeat	8 injured
13	Elias Street, Lagos		2004	Rainstorm	8
14	Iponri		2005	Inappropriate Foundation	Nil
15	OkeSuna, Lagos		2004	Structural degeneration	1
16	Broad Street, Lagos		2006	Rainstorm	Not disclosed
17	Ebute Meta		2006	Structural defeat	37
18	Ebute-Meta, Lagos	Multi-storeyComercial residential building	2007	Unauthorized conversion/poor supervision/use of quality materials	Several people
19	Kano	Multi-Storey Building	2007	Faulty design/structural failure	Several people
20	Oworonsoki		2006	Faulty Construction	1
21	Abuja		2008	Faulty Construction	3 died, 10 injured
22	Olomi Area Ibadan, Oyo State	A building being used as Nursery/Primary School	March 25, 2008	Use of poor materials carelessness	13 pupils
23	Wuse Area, Abuja	5-Storey shopping Complex Building under construction	2nd August, 2008	Structural failure incompetent/bad workmanship	2 people injured and 100 people trapped

24	Asero Rea, Abeokuta Ogun State	2-Storey residential Building under construction	20th August, 2008	Contravening the given planning Approval, use of substantial materials incompetency, etc	2 people
25	Ogbomoso, Oyo State	6-Storey Lautech teaching Hospital Complex under construction	19th February, 2009	Use of substandard materials, poor workmanship/supervision	5
26	Aghaji crescent, GRA, Enugu	A wall fence	10th August, 2009	No proper drainage	1
27	Oke Padre treet, Ita-morin, Abeokuta	Uncompleted building	18th October 2009	Use of substandard building materials	3 died, 11 injured
28	Isopakodowo Street Cairo, Oshodi, lagos	Building under Construction	26th April, 2010	Use of substandard building materials	4 died, 12 injured
29	Adenike street, Off new market, Oniru Estate VI	Uncompleted Storey building	2nd June, 2010	Use of Substandard building materials, non-compliance of house-owners and developers with approved building plan and weak structure	1 died, 2 injured
30	2 Okolie Street, Off Gimbiya Street in Abuja	Uncompleted 4-Storey Building	11th August, 2010	Substandard materials and disregard for building regulations	23 died, 11 injured
31	Abuja		2010	Faulty construction	Not disclosed
32	Garki, Abuja		2010	Overloading	23 died, 10 injured
33	24 Alli Street, Off Tinubu Street, V. I.	4 Storey building	28th September2010	Structural defect/overloading	3
34	Kano		2011	Rain storm	6
35	Abuja		2011	Overloading	100

36	Maryland, Lagos	Modern 5 Storey Office Complex	2011	Indications of an imminent failure of the structure	Not disclosed
37	Abuja		2012	Unsupervised demolition	2
38	Ikotun Egbe	Six Storey Building	12th Sept, 2014	Structural Failure	116
39	Ebuta Meta, Lagos	Three Storey Building	15th July, 2015	Weak Structure	Nil
40	Dolphin Estate, Ikoyi, Lagos	Residential Building of Senior Politician	11th July, 2015	Gas Explosion	3 injured

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Human Factors in Issues Responsible for Use or Disuse of PPE in Construction – Case Study

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Abstract:

This research aims to analyze the factors responsible for the use or disuse Personal Protective Equipment (PPE) in a construction work carried out in the city of Bauru/SP. PPE are all single use devices in order to provide protection against risks that may threaten the safety and health, and may even lead to death of the worker user. The methodology was applied in a bibliographic research approach and field research, which data collection was carried out with construction workers in the city of Bauru/SP, by applying a previously structured questionnaire. At the end of this research we reached the conclusion that the lack of effective supervision and the lack of ergonomics of the equipment are the main reasons for non-use of PPE for a small share of workers.

Keywords: *Construction, Personal Protective Equipment (PPE), Security.*

Introduction:

The construction industry is a sector of the Brazilian economy of great importance. It is linked to the industrial sector which depends almost entirely of manpower. This workforce consists, for the most part, by male contingent of economically less privileged social classes who are at risk of fatal occupational accidents and not considered fatal occupational accidents and incidents.

The incident can be defined as an unscheduled event could hinder operational efficiency on a construction site. According to Gonçalves (2003) the accident is also an unscheduled event that results in an injury or illness to one or more employees of the site. The prevention of incidents is necessary to prevent accidents at work, since every accident is an incident, however not every incident is an accident.

Pursuant to Art. 19 of Law No. 8,213, of July 24, 1991:

> Art. 19 Work accident is what happens for the exercise of the company's service business or the exercise of work of the insured referred to in item VII of article 11 of this law, causing personal injury or functional disorder that causes death or loss or reduction, permanent or temporary, the ability to work. (BRAZIL, 1991).

According to the Statistical Yearbook of Industrial Accidents, in 2011 the construction had 59,808 accidents at work, while in 2012 the figure stood at 62,874. Note that each year the number of accidents increases, a fact that deserves attention.

Companies in the construction sector are aware of the negative psychological impact when accidents occur with death on construction sites. Because of this, the issue of workers' collective and individual security is becoming increasingly important in construction because it is one of the industrial sectors with the highest accident rates.

According to the Regulatory Standard 6 (RS 6), Personal Protective Equipment (PPE) is any device or product, for individual use used by the worker, for the protection of susceptible risks threaten the safety and health at work.

According to Lopes Neto and Barreto (1996) PPE should be used in specific and legally established situations such as the case where collective protection measures are not feasible, emergency or while collective protection measures are being implemented.

There are many impasses by workers regarding the use of PPE. The acceptance and awareness of the use by them is a big problem. PPE are often trivialized by its use lack of legislation, instructions and standards accessible to workers.

According to Araújo (2003), the main causes of accidents are the long working hours, night work, inadequate temporary facilities, lack of use or misuse of PPE, among other factors.

For Montenegro and Santana (2012), PPE must be practical, effective, easy to maintain and strong. So, with the most comfortable and efficient equipment, the worker will accept more readily the use of PPE. Thus, productivity is not largely affected.

PPE are divided in terms of body areas. There are equipment for head protection, eye and face, hearing, respiratory, upper limbs (hands and arms), lower limbs (feet and legs) and the trunk. There is also equipment against falls.

PPE most used in construction are related to:

• Head protection: are used skull protective helmets against impacts. They are the types front flap, overall flap or front flap with visor.

Figure 01: Helmet type front flap. Source: http://www.deltamt.com.br/prod_capacetes.php

Figure 02: Helmet type full tab. Source: http://www.hsj.com.br/loja/produto.php?produto=129

Figure 03: Helmet type front flap with visor. Source: http://s-trabalho.webnode.com.br/outros/e-p-i-/

• eye and face protection: are used masks and safety glasses with clear or dark tint lenses.

Figure 04: Safety glasses. Source: http://www.danny.com.br/oculos-de-protecao/oculos-seguranca-fenix-fume-cinza.html

• Hearing protection: are used plugs, ear muffs or ear plugs.

Figure 05: Noise earmuffs. Source: http://www.superepi.com.br/protetor-auditivo-s50/

Figure 06: Ear Protector. Source: http://www.superepi.com.br/protetor-auditivo-s50/

• Respiratory protection: are used masks and disposable air purifying respirators and filter.

• Protection of the upper limbs: They are used protective gloves in scrapes, vaqueta or rubber. The zest of glove used for handling stressful materials such as transport concrete blocks. The vaqueta glove is suitable for electrical activity. Rubber glove is used for handling cement, mortar and products that undergo chemical reactions.

Figure 07: scrapes Glove. Source: http://www.caepi.com.br/luva-de-raspa-cano-curto--p4023

Figure 08: vaqueta Glove. Source: http://www.equipamentodeprotecaoindividual.com/epi/luvas-de-protecao/luvas-de-vaqueta

Figure 09: Rubber glove. Source: http://segurancadotrabalhonwn.com/o-que-e-epi/

• Protection of the lower limbs: boots are used, leather boots or long-barreled rubber boots, protecting against punctures, falling objects and slipping.

• Trunk Protection: are used aprons, jackets and pants waterproof fabric.

• Fall Protection: we use the harnesses seat belt, which is attached to the cable life by lanyard (which can be single or double). There is also the device hangs falls, catching possible falls of the professional while working at height. According to the RS 35.1.2, working at height is the work done over 2 meters high, where there is risk of falling.

Figure 10: Seat belt harnesses. Source: http://www.equipamentodeprotecaoindividual.com/epi/cintos-de-seguranca/cinto-de-seguranca-paraquedista

Figure 11: Lanyard. Source: http://www.as-solucoes.com.br/loja/index.php?route=product/product&product_id=273

Figure 12: fall arrest device. Source: http://www.lojamaxipas.com.br/cat/cintos/5207.html

Importantly, all PPE has a CA (Certificate of Approval) provided by the Ministry of Labor and Employment.

According to the legislation, together with PPE, any construction activity should also present the Collective Protection Equipment (CPE). According to the RS 10, the CPE is every device, mobile or fixed collective scope, which has the purpose to preserve the physical integrity and health of employees and contractors. Among the most common CPE include: traffic cones, warning tapes, metal grille, strobe flag[1], stool and insulating blanket. However, in practice, often only the PPE is used for security professionals, not occurring analysis of the collective environment.

[1] Flag Strobo: Service Identification, works, accidents and calls on streets and highways.Source:

http://www.metalica.com.br/equipamento-de-protecao-coletiva-epc

Figure 13: Signalling cones. Source: http://maceio.tudotemos.com/market/oborrachao_VendasdeConesdesinalizacao_SegurancaEquip_16017

Figure 14: Signal Tapes. Source: http://novorumosegurancadotrabalho.blogspot.com.br/2012/12/equipamento-de-protecao-coletiva-epc.html

Figure 15: Grid. Source: http://www.enfoquevisual.com.br/catalogo/isolamento-de-area

Figure 16: Flag strobe. Source: http://www.distrinox.com.br/produto/sinalizador-de-led-strobo-com-base-magnetica.html

Among the difficulties of application of CPE, we can mention the impossibility and the technical infeasibility. The failure occurs because of the physical facilities of some works not behave such equipment. And the impossibility is related to the economic sector, because due to market forces, it is not feasible to invest in something temporary.

In construction the order of most accidents is: falls, electric shock and burials. These accidents are due to work at great heights and excavation without the use or misuse of PPE.

At construction sites is also observed absenteeism. It is characterized by the absence or delay of employees at work due to some reasons, such as illness, personal problems, transportation problems, repetitive movements, excessive workload, and poor supervision, among others. In construction, the workers' absenteeism is due to back pain and increases considerably in winter because due to the cold, workers get sick more easily.

Absenteeism leads to increased costs for businesses due to paid workers and momentary replacement contingent away. These factors affect productivity and the quality of services provided.

Objectives:

The objective of this research is to identify what are the main reasons why the construction workers, in most cases, not to use or minimize the use of Personal Protective Equipment (PPE) while conducting works.

There is also the objective of this research show awareness of measures that can be adopted to prevent and mitigate the impacts of accidents at work, seeking improvements in the safety, health and the work generating the effect of increasing worker efficiency.

The objectives will be achieved through a literature search in various information sources, and a field survey which data collection will be performed with construction workers through a previously structured questionnaire.

Methodology:

The research will be developed in two stages. The first time was the development of literature, where it identified the factors that are important for the development of research. In a second step a questionnaire was applied to the construction workers on the use of PPE in their activities at the construction site.

For the preparation of this research will use the quantitative method. They will be collected information, opinions and data with subsequent analysis by resources and statistical techniques. This collection was performed by applying the questionnaire to construction workers. The questionnaire was structured to make an assessment of whether to use of PPE in everyday activities in construction, within a daily work routine.

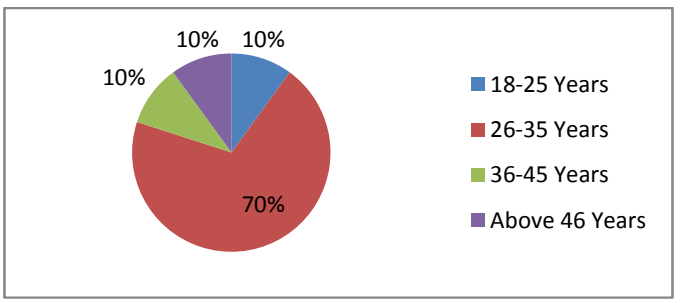
All questionnaires were analyzed and the data were divided by their contents. Ten construction workers were interviewed. The number of interviews was previously established as being 10% of the quota of the project workers. The selection of respondents was made randomly, with voluntary participation.

Results and Discussion:

This research has quantitative character, that is, beyond the bibliographical research in scholarly articles, books, databases and specialized sites, a questionnaire was applied to workers of a construction work in the city of Bauru/SP.

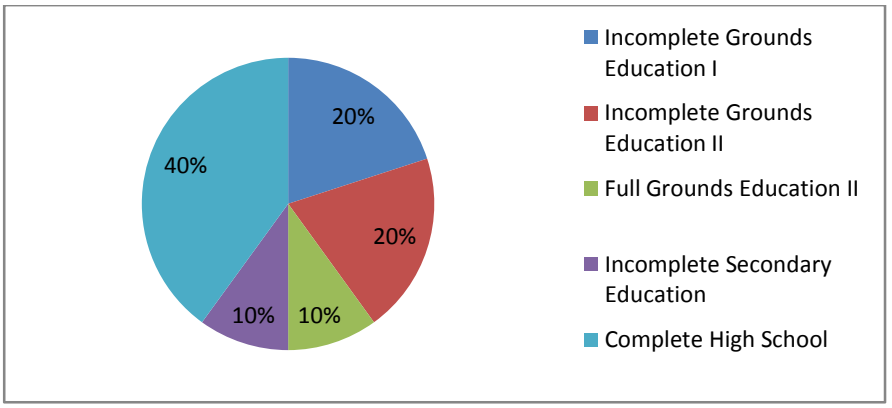
The work of this residential building is located in Garden Infante Dom Henrique neighborhood and the interview was held on November 18, 2014, between 12:30 and 13h15min with a sample of 10 employees, representing 10% of the work contingent. Thus, we obtained a construction company's profile and behavior of workers in relation to PPE.

The workers interviewed are all male, mean age 33.6 years. As the grapf 01, 10% of workers are aged between 18 and 25 years, 70% between 26 and 35 years, 10% between 36 and 45 years and 10% of respondents have more than 46 years.



Graph 01: Age of workers.

The education of respondents is quite varied. According to the graph 02, 20% of workers have incomplete grounds education I, 20% have incomplete grounds education II, 10% have full grounds education II, 10% had incomplete secondary education and 40% have complete high school.

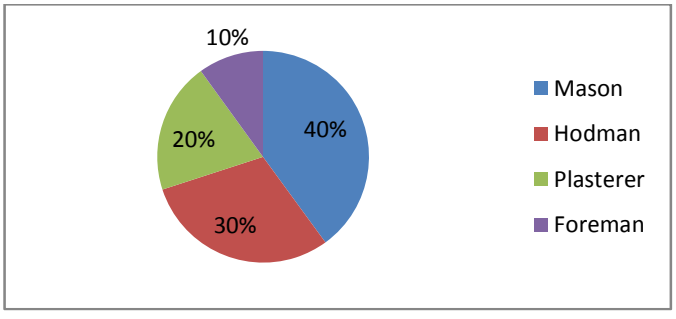


Graph 02: Education workers.

It can be concluded that the construction absorbs little skilled labor of people with low educational level. But it is observed that the higher the education level of workers, more aware of the need to use PPE they own.

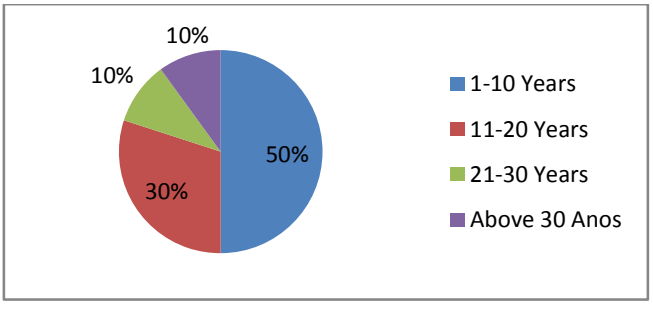
Oliveira and Pilon (2003) claim construction as the industry-absorbing labor without proper qualification. This is because the work on the construction site does not require experience, prevailing quantity over quality.

The workers interviewed have various functions in construction, among which: mason, hodman, plasterer and foreman. This variety can be seen in the graph 03.



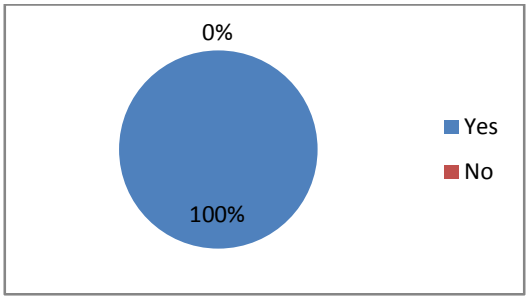
Graph 03: Function in construction.

As for the time working in construction, according to the graph 04, 50% work 1-5 years, 30% 11-20 years 10% 21-30 years and only 10% work for over 30 years in construction.



Graph 04: Switching time in construction.

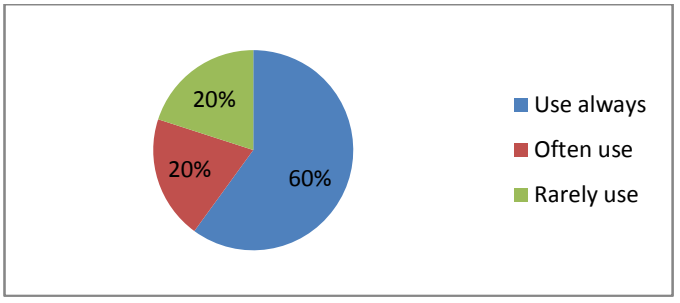
As to question 1, if the builder provides the necessary PPE, all workers said yes, according to the graph 05. As follow-up question was asked so they speak which PPE are provided. They are: ear, mask, goggles, gloves, safety belt, helmet and boots.



Graph 05: The construction company provides PPE required for its function?

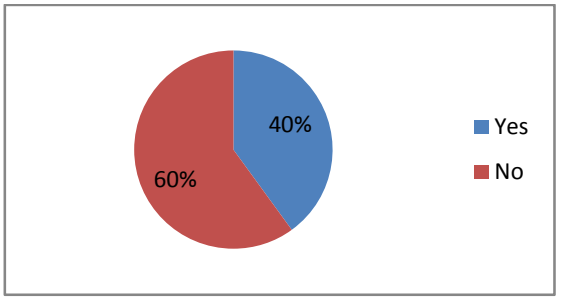
This question showed the behavior of the major construction companies in the construction industry. Due to legal regulations, provide all the necessary PPE employees, according to each function as specified by RS 6 and require their use.

Question 2 was intended to know the frequency with which workers used PPE. As the graph 06, 60% use always, 20% often use and 20% rarely use.



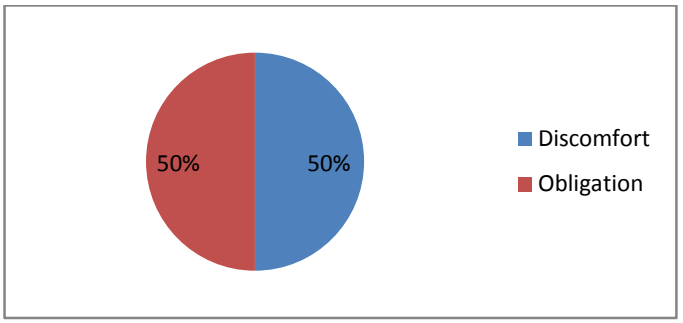
Graph 06: How often use the supplied PPE?

According to the third question, which was raised whether the workers like it or not to use PPE, it may be noted from the graph 07 that only 40% like to use them.



Graph 07: Do you like to use them?

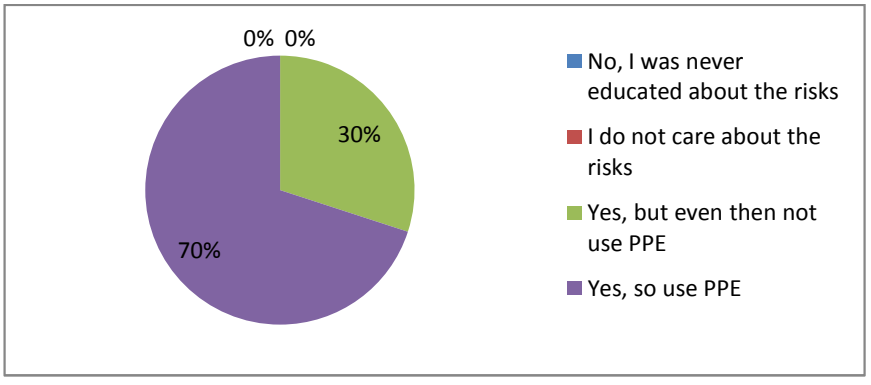
Question 4 was applied only to respondents who answered NO in the previous question. The reason for this question was to know why the workers do not like to use the PPE. The six responses (60% of the previous question) were divided equally between obligation and discomfort, as the graph 08.



Graph 08: If the answer is NO, why do not like to use them?

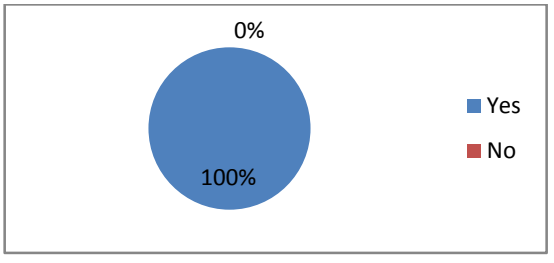
The biggest complaints about the use of PPE are linked to workers over time profession. They believe that with the experience, know the risks in the workplace and have less chances of suffering accidents, however, as a rule of construction, are required to use them.

As to question 5 on the awareness of risks of non-use of PPE, it can be seen from the graph 09 that all workers are fully aware of them.



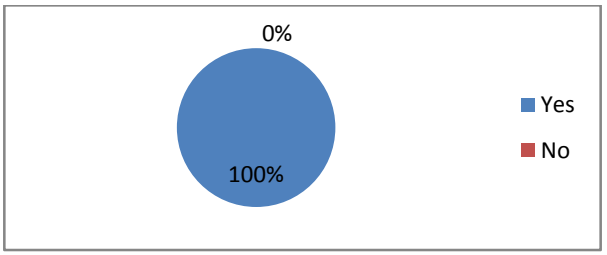
Graph 09: You are aware of no use of PPE?

To question 6, it was raised if they have had some instruction on the proper use of PPE, 100% of workers said they have had, as the graph 10.



Graph 10: Have you had any instruction on the proper use of PPE?

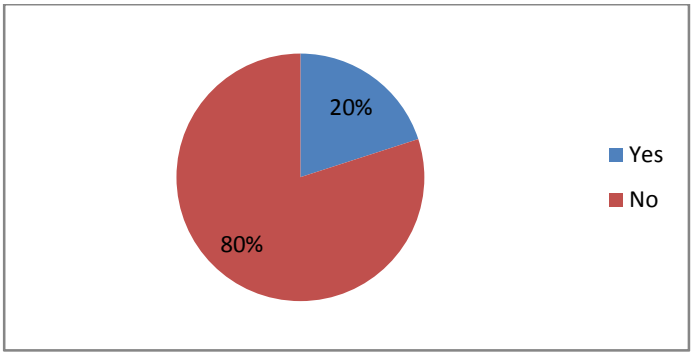
Question 7 raised if the employee finds it interesting that the construction companies to invest in education on the use of PPE. Again, all respondents find this valuable initiative, according to the graph 11.



Graph 11: Do you think the interesting construction invest in lectures and / or training on the proper use of PPE?

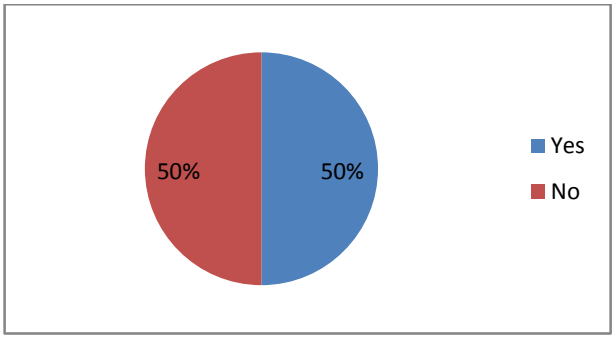
According to interviewees, the construction company to which they are providing service always promotes lectures and short courses on health and safety in the workplace. For the interview the morning, by coincidence, a lecture on hygiene at work was given.

The last two questions have more personal. Question 8 wanted to know if workers have suffered an accident at work. Only two (20%) had already suffered in the past. One of them fell off a ladder from a considerable height and the other broke his arm. The result can be seen in graph 12.



Graph 12: Have you suffered an accident at work?

Question 9 was held to just two workers who had already suffered work accident. The intention was to raise this issue if they were using or not the PPE during the accident. According to the graph 13, one used and the other does not.



Graph 13: If YES, used PPE when he suffered?

Conclusions:

According to the data obtained from the questionnaire on the use of PPE to employees working in the area of construction of a work in Bauru/SP, we can highlight the construction, which they provide service, offer and demand the use of PPE for all those who are within the limits of the work.

It's really worrying that workers over time of profession, are mostly the do not like to use the PPE, and use only under compulsion. The justification given by them is that the devices are uncomfortable and hinder the execution of certain functions, there are ergonomic problems. However, younger workers do not fail to use them because most have awareness of the risks that non-use of PPE can cause. One of the workers, during the interview, denounced that a small minority of employees that work does not use the supplied equipment. According to him, this happens by the lack of oversight by the construction company.

Importantly, all employees of that construction had instruction on the proper use of PPE, either by constant lectures or courses. All workers think it is important that action passed awareness by the construction.

The building has its own characteristics, making up almost exclusively of hand labor, which increases the risk of accidents, requiring special attention to safety, both by builders as by workers.

Importantly, the construction site must also submit the CPE, so that together with PPE can reduce the chances of accidents. The result of the awareness of workers will be observed in the long-term, favorable to both workers and construction companies that will lower costs with accidents, disability and death at the construction site.

Final Considerations:

This research sought to identify, through the use of quantitative techniques of data collection, the factors responsible for the use or misuse of PPE in a construction work carried out in the city of Bauru/SP. Data analysis showed positive and negative actions on the part of the Construction Company and workers.

The positive action of the construction refers to the fact that it offer PPE to all employees and invest in lectures and courses on health and safety at work. For workers it can be noted that many of them have awareness of the negative consequences of non-use of PPE. The negative action on the part of the construction is over there is no intense scrutiny in the use of equipment by employees. In relation to workers, some of them do not like to use and a minimum percentage of these do not use PPE even being forced by the construction.

Required by law as a way of preventing accidents, only requiring the use of PPE and simply providing not prevent accidents from happening.

At the end of this research we reached the conclusion that the lack of effective supervision and the lack of ergonomics of the equipment are the main reasons for non-use of PPE for a small share of workers. It is necessary to reassess the adaptation of the same towards people who use them, not only considering anthropometric questions, but also the quality of the materials used, so that the workplace becomes safer and more pleasant, bringing more quality life to the worker.

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The imbalance of endogenous nitric oxide and endothelin-1 in in very low birth weighing infants with patent ductus arteriosus

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Keywords : Patent ductus arteriosus , nitric oxide, endothelin-1.

Introduction

Patent ductus arteriosus (PDA) is due to the failure of the ductus arteriosus to close after birth, and its incidence being inversely related to gestational age and birth weight (1,2). The incidence of PDA in term infants has been estimated to be 57 per 100 000 live births, whereas every third preterm infant with a birth weight of 501 to 1500 g can be expected to have a persistent PDA, and in premature extremely low birth weight infants (< 1000g) it's as high as 50-65% (3,4).

The presence of a PDA allows continuous shunting of blood from the aorta to the pulmonary artery due to the higher blood pressure in the systemic circulation compared to the pulmonary circulation. Preterm newborns with PDA are at greater risk for the the different morbidities, such as bronchopulmonary dysplasia, hypotension, renal dysfunction, intraventricular hemorrhage (IVH), and periventricular leukomalacia (PVL) and for other perinatal complications (5,6,7,8).

The closure of ductus arteriosus is mediated by the balance of vasoconstricting (endothelin) and dilating (PGE2) mediators, and this process is mediated by increased oxygenation and reduced flow through the ductus arteriosus. Extremely preterm infants are at increased risk of PDA due to elevated levels of PGE2, increased PGE2 receptor levels and reduced intrinsic vascular tone. In preterm infants, the sensitivity for oxygen is reduced, and in contrast, the sensitivity to PGE2, nitric oxide (NO), and endothelin 1 is increased (9). In spite of different biomarkers have been investigated to identify significant PDA and determine indication, timing, and treatment options (10,11,12), a firm recommendations on a particular treatment strategy cannot be made.

The lack of sensitive presymptomatic markers also causes in delay of intervention procedures, and by this way increasing the morbidity and mortality of very low birth weight infants with PDA. The purpose of this study is to monitor the changes nitric oxide (NO) and endothelin-1(ET-1) concentrations sequently, and to evaluate the relationship among them in the pathophysiology of PDA in preterm infants.

Methods

Total 44 preterm infants with gestational age between 28-34 week and birth weight less than 1500 g were included in the study. The infants were classified as PDA group (n=24) and non PDA group (n=20). Obstetrical data were collected from the hospital records. Intrapartum and neonatal data were collected prospectively. The data on maternal preeclampsia, gender, type of delivery, resuscitation measures in the delivery room, and anthropometrical measurements (e.g., weight, body length, head and chest circumference) were included on an individual research card for each infant. The diagnosis of asphyxia was determined by the Apgar score (less than or equal to 5 at 5 minutes of life), an initial capillary or arterial pH value less than 7.00, and an initial capillary or arterial lactate value greater than 7.00 mmol/L, according to the American Academy of Pediatrics guidelines (13). Blood gases were detected within 30 minutes after delivery. The gestational age was based on the date of the most recent menstrual period of the mother and an ultrasonogram and was confirmed using the scale by Ballard et al (14). The study exclusion criteria included the death of a newborn within the first 3 days of life, transfer to other units,

clinical or laboratory evidence of congenital infection, neonatal sepsis, or congenital malformation. After clinical consequences (bounding peripheral pulses, hyperactive precordium, systolic murmur, persistant tachycardia etc.) PDA and its hemodynamic significance was evaluated echocardiographically on days 3 and 4 of life (15).

Blood collection. Venous blood was collected on day 1 of life. No venous punctures were performed for the sole purpose of study-related analysis. The blood samples were collected in EDTA tubes and centrifuged for 15-20 minutes. The plasma samples were frozen at -70ºC. Grossly hemolyzed samples were not included in the analysis.

Determination of NO concentration in peripheral blood. The NO concentration was quantified using the Griess reaction in a commercial kit (Thermo Scientific, Pierce Biotechnology, Rockford, IL, USA). This test is based on the conversion of nitrate to nitrite via the action of the nitrate reductase enzyme. The NO levels in a given sample were measured by determining the nitrate and nitrite concentrations in the sample. The samples were ultra-filtered through a 10 000 molecular weight cut-off filter and directly assayed. The nitrite concentrations were determined using the nitrite standard curve. The nitrate concentrations were calculated by subtracting the initial nitrite concentration of the sample from the measured nitrite concentration following the enzymatic conversion of nitrate.

Determination of ET-1 in the peripheral blood by ELISA. The ET-1 plasma concentrations were measured using the commercial kits (Cayman Chemical Company, Ann Arbor, USA), based on a standard enzyme immunoassay procedure. The specimens were diluted according to the manufacturer's instructions for the ELISA kits to obtain the optimal density.

Statistical analysis. The data in the subgroups of both groups were tested for a normal distribution and found to be nonparametric. Significant differences between the control and asphyxiated preterm groups were determined using the Mann-Whitney U-test to assess the differences in NO and ET-1 production. Quality variables such as gender, maternal preeclampsia, Cesarean section, resuscitation measures in the delivery room, and the degree of HIE and IVH were compared using Fisher's Exact test. In all instances, significance was established at $p<0.05$.

Results

Maternal characteristics are presented in Table1. Mothers of the PDA and non PDA group infants were similar according to age, gravidy, medical illnesses and pregnancy complications.

Table 2 shows the neonatal characteristics of the subjects and the most important clinical data from the study groups. Perinatal asphyxia was frequently observed in PDA group infants, and majority of these newborns required bag and mask ventilation or intubation in the delivery room. Severe HIE and IVH grade II-III were also significantly higher in PDA infants compared with non PDA group.

As described in diagram 1, It was found low concentration of ET-1 on day 1 (3,4± 1,12 ng/ml vs 4,9 ± 0,56 ng/ml, $p<0.05$) in PDA group. Although we detected elevated levels of NO on day 1 in PDA group (46,5± 4,3 µM/l vs 32,42 ± 4,408 µM/l), the differences in the parameters between the two study groups were not statistically significant. It was not determined significant results on day 3 parameters of ET-1 and NO.

Diagram 2 describes the NO/ET-1 ratio preterm groups. We found significantly high NO/ET-1 ratio in PDA infants compared with non-PDA group.

Discussion

The diagnosis of PDA based on clinical features alone has some insufficiencies such as low sensitivity and delay in detection in spite of clinical features of a PDA are mainly. Echocardiography is the most effective method for diagnosis of PDA. However it does not always reflect the hemodynamic significance of the ductus and needs to be used in conjunction with the clinical findings. Newer diagnostic biomarkers like brain natriuretic peptide (BNP) and N-terminal-pro- BNP which has shown good sensitivity and specificity. Though these markers are promising, there widespread clinical use is yet to

emerge. Postnatal ductal closure is regulated by exposure to oxygen and vasodilators, which depends on gestational age and birth weight of infants.

ET-1 is a potential vasoconstrictor and plays an important role in early postnatal adaptation processes. Our study confirms the results of previous investigations about the deficiency of constricting mediators and reduced intrinsic vascular tone in the pathogenesis of PDA. We also found the difference of NO/ET-1 ratio of study groups, which confirms the possible role of NO/ET-1 imbalance in the patency of ductus arteriosus of preterm infants.

In spite of various clinical and experimental investigations, there is lack of universal consensus regarding the effective criteria for initiating treatment of PDA. Based on the results of our study on very low birth weight infants, we conclude that perinatal complications of these newborns cause endothelial cell injury and as the indicators of endothelial dysfunction NO/ET-1 imbalance might be the stimulator of PDA.

Our findings might stimuli the further studies about the research of best markers for early diagnosis and treatment of PDA in preterm infants.

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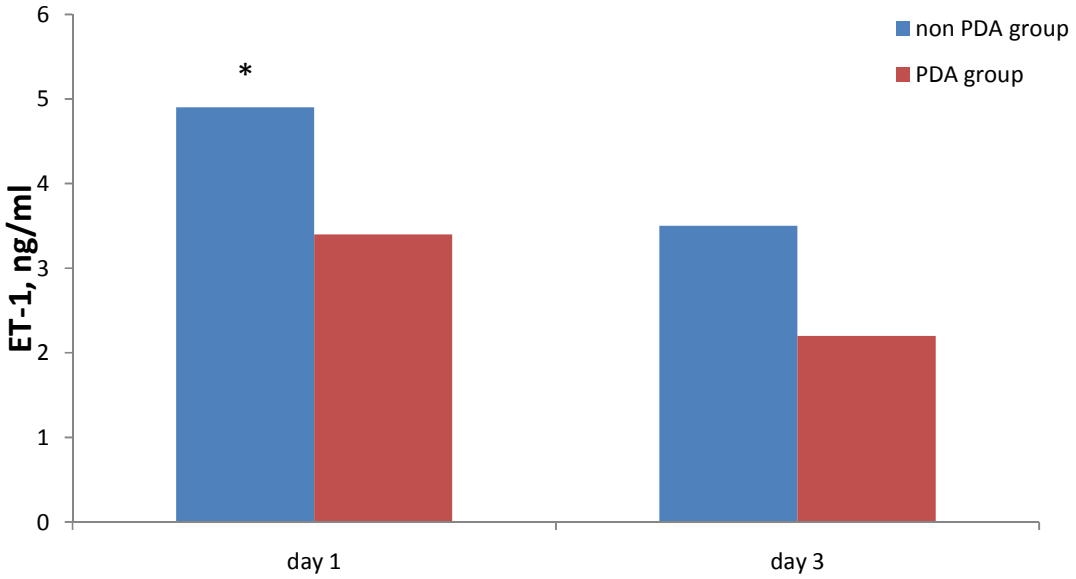
Table 1. Important maternal characteristics

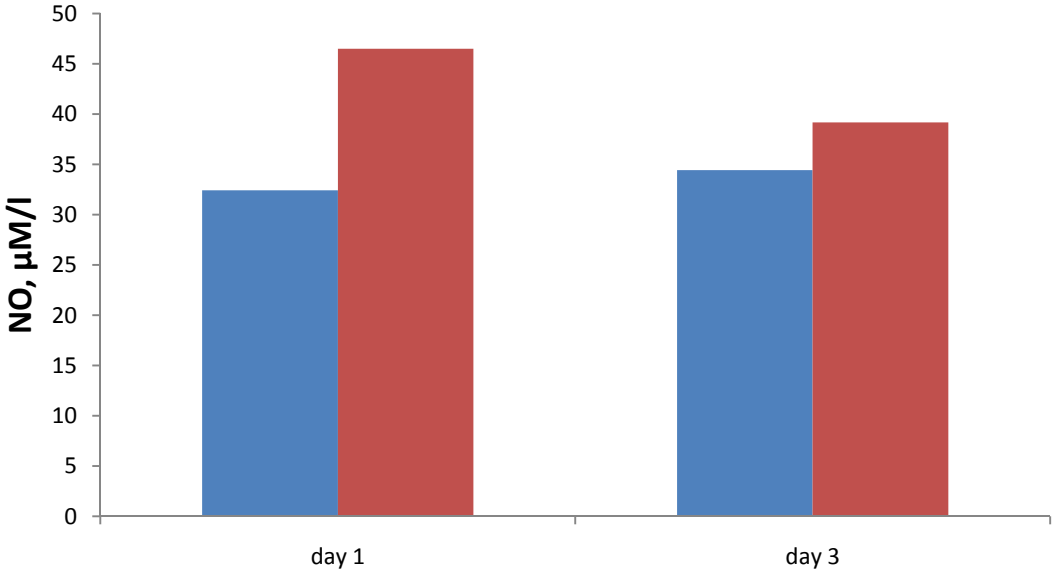
	non PDA group,(n=20) mean (range) or n (%)	PDA group,(n=24) mean (range) or n (%)
Age, year	24.2 (19-33)	26.9 (20-33)
Gravidy	2.3 (1-6)	2.3 (1-7)
Premature rupture of membranes	6 (30)	6 (25)
Chronic hypertension	1 (5)	2 (8.33)
Oligohydramnios	2 (10)	2 (8,33)
Preeclampsia	4 (20)	5 (20.83)
Cesarean section	6 (30)	8 (33.33)

Table 2. Important characteristics and clinical parameters of the infants.

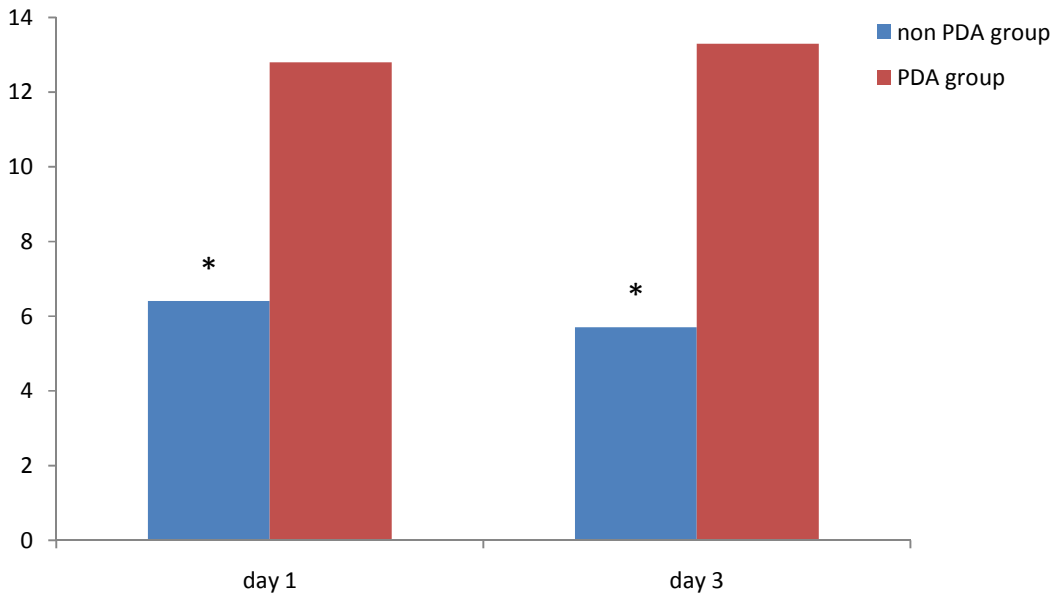
	non PDA group,(n=20) mean (range) or n (%)	PDA group,(n=24) mean (range) or n (%)
Birth weight, g	1343.2 (1001-1496)	1110.4 (980-1310)
Gender M/F	11/9	12/12
Perinatal asphyxia	8 (40)	16 (66.6)
Mean arterial blood pressure, mm Hg	31.8 (26.4-35.20)	28.8 (24-31.3)
Free flow oxygen*	6 (30)	3 (12.5)
Bag and mask ventilation*	5 (25)	12 (50)
Intubation*	1 (5)	6 (25)
Degree of encephalopathy		
Mild	4 (20)	3 (12.5)
Moderate	6 (30)	6 (25)
Severe	3 (15)	12 (50)†
IVH		
Grade I	2 (10)	4 (16.6)
Grade II-III	3 (15)	13 (54.16)†

IVH, intraventricular hemorrhage; AGA*results indicate resuscitation required in the delivery room; †significance of the difference between non PDA and PDA groups.





Diaqram 1. ET-1 and NO concentrations of study groups. *significance of difference between groups $p<0.05$.



Diaqram 2. NO/ET-1 ratio of study groups. *significance of difference between groups p<0.05.

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IMAGE REPRESENTATION WITH NONSYMMETRIC REGION BASED ON SEGMENTATION AND INPAINTING TECHNIQUES

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Abstract

In this paper, we propose a method to represent the image based on the image color constitute region, to retain the color texture information, and to reconstruct image by interpolation. The image would be segmented by the watershed algorithm to get color gradient direction as the texture information, and be represented by asymmetric and anti-packing model. The gradient direction would indicate the color trend layer and the image would be decomposed into multiple tone area. Each region of the image intensity extreme value and the gradient change direction would be used to inpaint the image intensity of rest position by linear interpolation. Because the image inpainting by linear interpolation, the smaller variation of intensity tendency, the more color composition regions are used, and the higher quality of image.

Keywords: Image Segmentation, Image Representation, Image Reconstruction, Watershed Algorithm, Image Inpainting

1. Introduction

As the technology advances, the different application digital image needs different image representation. The main difference of image representation is the smallest unit and the relationship between the various units. There are four common methods of image representation: Pixel Representation, Chain Coding Representation, Compression Oriented Representation and Hierarchical Representation.

The pixel representation stores the complete original raw data, which arrange each color intensity of pixel sequentially. So the image processing with this format need to deal with each raw material pixels and that would influence effective treatment speed

The chain code representation uses the repeating pattern to construct image which could be used to simplify the image processing algorithm by deal with each patterns. However the pattern set would be different because of the different images content, and more complex image needs more large pattern set.

The compression oriented representation method reduces the redundancy of image data which cause image distortion. During image processing, it is need to decode the entire date which make some basic image processing more complex.

Unlike the above representation which recording the unit of image sequentially, the hierarchical representation is a tree or graph structure to describe the content of image. In 1998, Jason Knipe and Xiao

bo Li propose the quad tree structure in “On the Reconstruction of Quadtree Data”[1], and in 2008, Xia Hui and Chen Chuanbo propose Non-Symmetry and Anti-Packing Pattern Representation Model in ”Rectangle NAM image representation and contour extraction of binary image representation by NAM”[2][3].

Most image representation store the original data, but, in this paper, we try to combine the techniques of image segmentation and inpainting to develop a novel image presentation which find the key point by segmentation and then rebuild the image by image inpainting.

Common image restoration technology can be broadly divided into two types: texture synthesis and image repair. In 2012, Jino Lee, Dong-Kyu Lee and Rae-Hong Park propose the image reparation by region segmentation as reasonable visual effects in “Robust Exemplar-Based Inpainting Algorithm Using Region Segmentation”[4], which using the strength and toughness priority function parameter selection and curve connection methods to achieve image repair. So with The difference of Gaussians (DoG) to select the appropriate parameter values, and then input the image, segmentation map and suitable parameter values into the Criminisi’s algorithm [5] to generate result.

Also in the literature[6], Cheng provides the toughness priority equation using DoG value to determine the weighting parameter which has considerable influence in the transmission structure assembly. In the literature[7], report that using Bézier curves connection method rebuilds the broken boundary line in segmentation map would effectively make the image texture patched smoother. Besides, there are several uses of technologies to achieve better repair results, such as the mean shift segmentation, image reparation based on the exemplar and Bézier curves, etc. In the literature [8][9], it is concluded that finding the image outline needed repair would get better repair results.

In order to reduce the impact of color and texture, we select watershed algorithm to generate color gradient direction as texture information, and color distribution as contours. According to Non-Symmetry and Anti-Packing Pattern Representation, the image can be decomposed into a lot of hue regions. Finally the image rebuilt form the strength and gradient direction of each area by Exemplar-Based Image Inpainting.

2. Research Methodology

2.1 Watershed Algorithm

In 1982, Serge Beucher presents a watershed algorithm in "WATERSHEDS OF FUNCTIONS AND PICTURE SEGENTATION"[10], which operate erosion on image until the point which equidistant from both sides. It is useful in object skeleton extraction.

In 1991, L. Vincent and P. Soille improve the watershed algorithm in “Watersheds in Digital Spaces: An Efficient Algorithm Based on Immersion Simulations”[11], The proposed watershed algorithm is as follows:

1. Define the gradient value of each pixel.

2. Ranking all of the pixels according to the gradient value ranking and processing from the pixel with smaller gradient value.

3. Setting the pixel with a minimum gradient value as the center of the region and labeling the neighbor pixels as the same region.

4. The white ball in figure 1-a, represents two pixels with a minimum gradient value, and the gray ball in figure 1-b is represented the adjacent pixels making by a white ball. Put the marking white ball and gray ball into the priority queue, as shown in figure 1-b.

5. During the marking process, if there is a pixel with smaller gradient than the gray ball, put this ball into priority queue, as the black ball shown in figure 1-b, labels this pixel points as another area center, and start to mark another area. Repeat steps 3 to 4 until all pixels are classified.

The principle of Watershed algorithm is that taking the image intensity gradient values as height information, the water will flow to lower-lying areas by gravity, making the drowned area by water will form the watershed, which is the component region of image.

John M. Gauch proposed an easy way to perform watershed algorithm[12], which decide the water flow to which the eight neighborhood by equation (1). As shown in figure 2, the water flow would perform a smooth image region.

$$mark(x,y)=\begin{cases}0 & if\ I(x,y)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 1 & if\ I(x-1,y-1)<I(x',y')\forall x-1<x'<x+1,\forall y-1<y'<y+1\\ 2 & if\ I(x,y-1)<I(x',y')\forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 3 & if\ I(x+1,y-1)<I(x',y')\forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 4 & if\ I(x+1,y)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 5 & if\ I(x+1,y+1)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 6 & if\ I(x,y+1)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 7 & if\ I(x-1,y+1)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\\ 8 & if\ I(x-1,y)<I(x',y')\ \ \forall x-1\le x'\le x+1,\forall y-1\le y'\le y+1\end{cases} \quad (1)$$

Usually, the watershed algorithm does not consider the gradient range; it would cause a segment mistake. Gauch uses Gaussian Blurred method in the image region with gentle intensity to merge the regional boundaries with obscure ridge. However, Merging partition with different gradient would make image inpainting difficult, we set the vary range in watershed algorithm to avoid the great intensity variation in a region.

$$if\ \ I(x,y)-min(I(x',y'))>T\ \ \forall\begin{cases}x-1<x'<x+1\\ y-1<y'<y+1\end{cases}\ then\ mark(x,y)=0 \quad (2)$$

2.2 Non-Symmetry and Anti-Packing Pattern Representation Model

In 2008, Xia Hui and Chen Chuanbo propose the NAM representation in "Rectangle NAM image representation and contour extraction of binary image represented by NAM." [13], which is a nonsymmetrical anti-packing pattern representation model. They improve the quadtree representation. The idea of NAM could be described as follows: the original image (containers) and n predefined sub-models with different shapes (n predefined objects). These sub-models (object) would fill an original image (containers), as shown in figure 3.

2.3 Object Removal Exemplar-Based Image Inpainting

Object Removal Exemplar-Based Image Inpainting referred EBI method, is used to deal with the lack of block section in image by patching, and make it visually reasonably. The EBI repair step explains below:

1. Select the area need to be repair or remove
2. Calculate the priority P(p) of the selected area
3. Find the area I_P need to be repair with greater P(p)
4. Calculate the best patch I_Q with greater similarity
5. Replace area I_P with area I_Q
6. Repeat setp2 to step 5 until all area is patched

Where P(p) is the priority defined as equation (3), C is the confidence defined as equation (4), D is data term defined as equation (5). And the way to find the best patch I_Q for the area I_P with greater priority P(p) is shown as equation (6).

$$P(p) = C(p) \times D(p) \tag{3}$$

$$C(p) = \sum_{q \in I_p \cap \overline{\Phi}} -C(q) / |I_P| \tag{4}$$

$$D(p) = |\nabla F_p^{\perp} \cdot n_p| / \alpha \tag{5}$$

$$I_p | P = \arg \max_{p \in \delta\Omega} P(p) \tag{6}$$

Where $|I_p|$ is the area of I_p, α is the normalize factor, $\nabla F_p^{\perp}$ is equal luminous intensity at point p, and n_p is the vector lint of point p.

3. Experimental Results

We test our method with USC-SIPI image database, the image is segmented to component unit, and then repair form the segmented unit to whole image, finally, we exam the result by MSE and PSNR. Figure 4 shows the PSNR of repaired image with different segment criteria, figure 5 shows the MSE repaired image with different segment criteria and figure 6 shows the amount of segmented block in repaired image with different segment criteria. The Criteria constrain the variation of intensity in segmented block which would impact the amount of segmented block and the effect of image inpainting.

$$\text{MSE}=\frac{1}{mn}\sum_{i=0}^{m-1}\sum_{j=0}^{n-1}\|I(i,j)-K(i,j)\|^2 \qquad (7)$$

$$\text{PSNR}=10\cdot\log_{10}\left(\frac{MAX_I^2}{MSE}\right)=20\cdot\log_{10}\left(\frac{MAX_I}{\sqrt{MSE}}\right) \qquad (8)$$

4. Conclusions

This paper propose an image representation which segment the image into component unit by watershed algorithm, remove the area with lower priority, arrange each component unit by Non-Symmetry and Anti-Packing Pattern Representation Model and repair the image by Object Removal Exemplar-Based Image Inpainting. This representation record the spatial relation between each blocks, and the intensity variation in each block is linear. Because most image processing could be treated as a linear transformation, it not only reduces the image storage size but also improve the efficiency of image processing by linear transformation with block matrix.

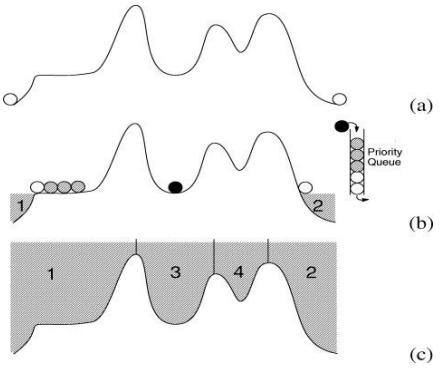

Figure 1: Illustration of the watershed algorithm by L. Vincent and P. Soille

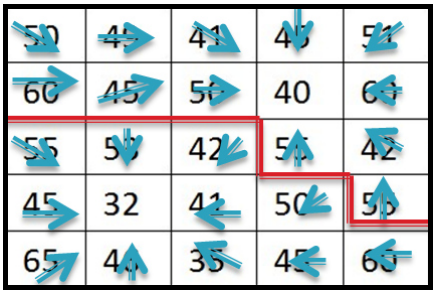

Figure 2: Illustration of watershed algorithm by John M. Gauch

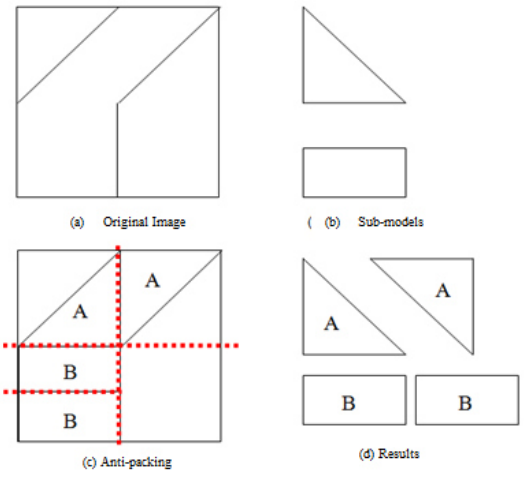

Figure 3: Illustration of NAM

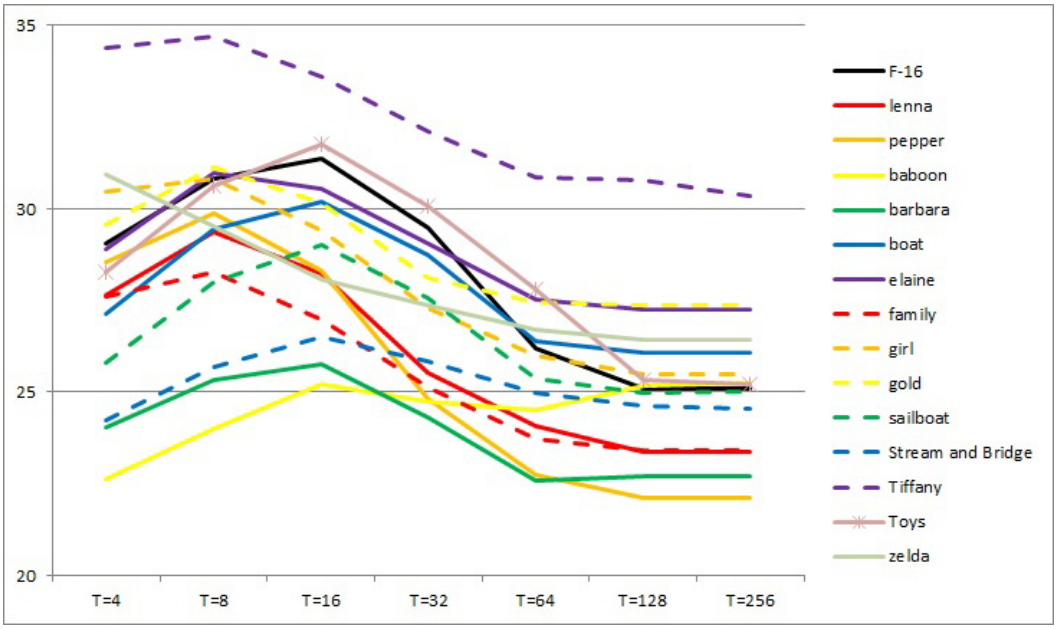

Figure 4: the PSNR of repaired image with different segment criteria

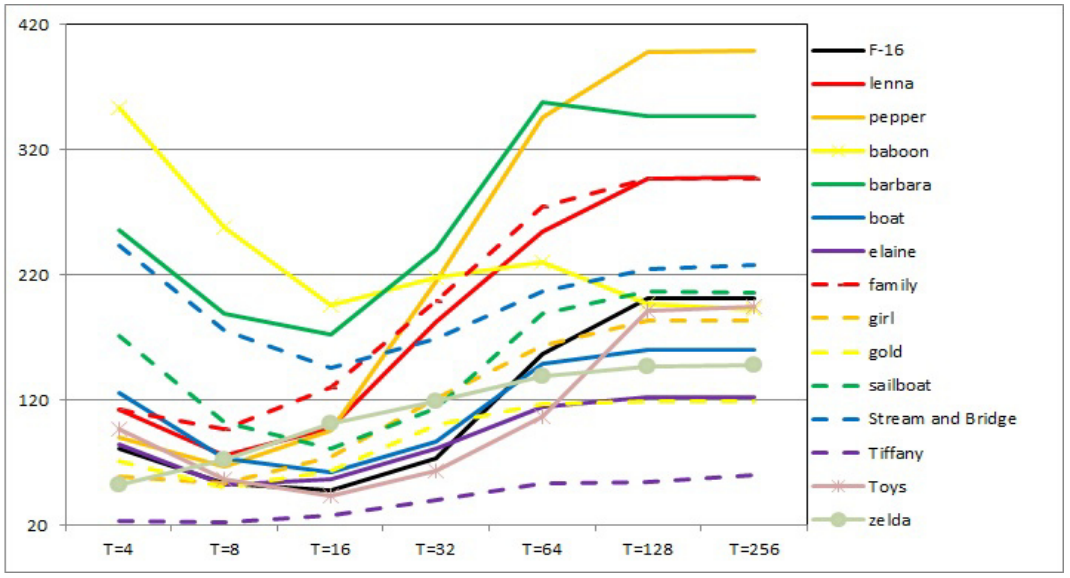

Figure 5: the MSE of repaired image with different segment criteria

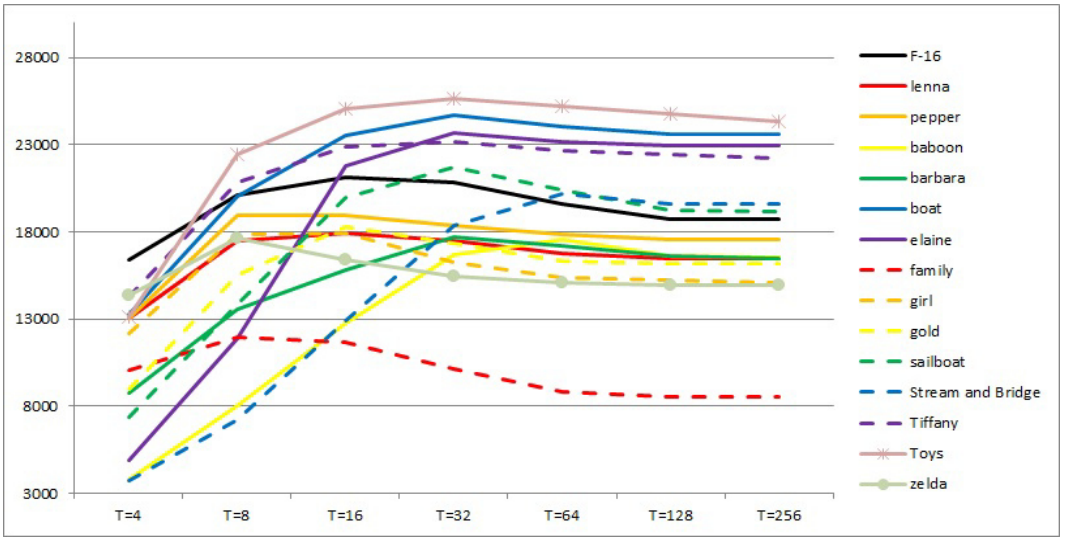

Figure 6: the amount of segmented block in repaired image with different segment criteria

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