EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 12
Issue: 2
Year: 2025

AN OBSERVATIONAL PROSPECTIVE STUDY ON INDICATIONS FOR INTRAPARTUM ANTIBIOTICS AND THEIR EFFECTS ON NEONATAL OUTCOMES

Vandhana G[1*], Devapriya Vijayan[1], Lekshmi Gopal U[1], Dr. Akhila S Arjun[2], Dr. Chitra C Nair[3], Dr. Beena P[4]

[1,1,1]Pharm D Intern, KVM College of Pharmacy, Cherthala, Kerala.
[2]Assistant Professor, KVM College of Pharmacy, Cherthala, Kerala.
[3]Professor and Head of the Department, KVM College of Pharmacy, Cherthala, Kerala.
[4]Principal, KVM College of Pharmacy, Cherthala, Kerala.

***Corresponding Author: Vandhana G**
Pharm D Intern, KVM College of Pharmacy, Cherthala, Kerala.
Email ID: vandhanag25@gmail.com, devapriyavijayan1847@gmail.com, lekshmigopal6@gmail.com

Article Received on 17/01/2025 **Article Revised on 25/01/2025** **Article Published on 01/02/2025**

ABSTRACT

Aim: To identify the clinical indications for intrapartum antibiotic therapy and asess its impact on neonatal infections. **Materials and Methods:** A 6 months study were conducted in a teritiary care hospital in Kerala, India to analyze the indications for intrapartum antibiotics and their effect on neonatal outcomes of 75 pregnant women. Case records were prospectively reviewed and recorded in a specifically designed data collection form. **Result:** This study revealed a high occurrence of Gestational Diabetes Mellitus (GDM) and hypothyroidism among the study participants, further complicating the maternal-foetal outcomes. **Conclusion:** The study findings highlight about vigilant neonatal care and maternal factors that influence neonatal health. **Clinical significance:** Administration of intrapartum antibiotic prophylaxis (IAP) to pregnant women with GBS colonization can substantially reduce the early onset GBS disease and its further added complications.

KEYWORDS: Neonatal infections, Intrapartum antibiotics, GDM, GBS disease, Hypothyroidism.

INTRODUCTION

The use of intrapartum antibiotics (IAPs) is one of the important interventions to reduce the risk of maternal and neonatal postnatal infection. IAPs are widely used in cesarean sections, and also considered important in vaginal deliveries to prevent transmission of disease. This is mainly a result of the mother testing positive for GBS, and in a few cases due to premature rupture of membranes. Although generally not harmful in healthy adults, exposure of newborns to the bacteria during delivery can pose a significant risk. In neonates, such infections can cause serious complications such as pneumonia, sepsis, and meningitis, which can be life-threatening if not treated properly.

The timing and duration of intrapartum antibiotics are critical to ensuring their effectiveness while minimizing potential risks associated with antibiotic use. Typically, intrapartum antibiotics are initiated at least four hours before delivery. This timeframe allows sufficient time for the antibiotics to reach therapeutic levels in the mother's bloodstream, providing optimal protection against GBS transmission to the newborn. The antibiotics are usually administered intravenously to ensure rapid absorption and distribution throughout the body. Commonly used antibiotics for intrapartum prophylaxis against GBS include penicillin, ampicillin, and cefazolin, although specific choices may vary based on factors such as maternal allergies and bacterial resistance patterns. To mitigate the risk of GBS transmission to newborns, healthcare providers administer intrapartum antibiotics to pregnant women who are colonized with GBS or who have certain risk factors. The administration of antibiotics during labour helps reduce the concentration of GBS bacteria in the birth canal, thereby lowering the likelihood of newborn exposure during delivery.

In cases where the mother's GBS status is unknown, or if she has certain risk factors such as preterm labour or prolonged rupture of membranes, healthcare providers may opt to initiate intrapartum antibiotics as a precautionary measure. Additionally, if a pregnant woman tests positive for GBS colonization earlier in her pregnancy but does not receive intrapartum antibiotics during labour due to premature delivery or other circumstances, antibiotics may still be administered at the time of delivery to provide protection to the newborn. The decision to administer intrapartum antibiotics and the choice of antibiotic regimen should be guided by

evidence-based guidelines established by professional medical organizations. These guidelines take into account factors such as maternal colonization status, gestational age, obstetric history, and local epidemiological data on GBS prevalence and antibiotic resistance patterns. By adhering to recommended protocols, healthcare providers can optimize the prevention of GBS-related neonatal infections while minimizing the risk of antibiotic-associated adverse effects.

While intrapartum antibiotics are highly effective in reducing the incidence of early-onset GBS infections in newborns, they are not without potential drawbacks. Antibiotic use during labour may contribute to the development of antibiotic resistance, both in the mother and in neonatal microbiota. Additionally, maternal antibiotic exposure can impact the newborn's microbiome, potentially affecting their long-term health outcomes. Therefore, it's essential for healthcare providers to carefully weigh the benefits and risks of intrapartum antibiotic administration on a case-by-case basis, considering the individual circumstances of each patient. The burden of infectious neonatal outcomes, includes sepsis, pneumonia, meningitis and other life-threatening conditions due to bacteria, viruses, fungi or parasites contracted during pregnancy, delivery or the post-partum period is a major contributor to morbidity and mortality among newborns globally. Newborns are especially susceptible to infections because their immune systems are immature.

MATERIALS AND METHODS

75 cases were collected from the obstetrics and gynaecology department.

$$N=\frac{(z_{1-\frac{\alpha}{2}})^2\sigma^2}{E^2}$$

σ is the standard deviation and E is the margin of error
Data from a previous study found a standard deviation of 1.1 Here σ = 1.1
z= 1.96 (95% confidence level)
E= 0.25

$$N=\frac{z^2\sigma^2}{E^2}=\frac{1.96^2\times 18.0^2}{0.25^2}=60$$

Anticipating loss to follow up and missing of data, the minimum sample size is rounded to be **75.**

An observational prospective study, conducted among the pregnant women in the OBG department in a teritiary care hospital, SH Medical Centre, Kottayam, Kerala, India for 6 month period. After obtaining permission from the IEC, Informed consent from individual patients the data collection were started. The study included all pregnant women with singleton gestation undergoing either vaginal delivery or cesarean section, while excluding those who were allergic to antibiotics, had incomplete medical records, or refused the vaginal swab. Case records are prospectively reviewed from OPD and IP and the information includes age presenting complaints, laboratory investigation data, other diagnostic reports, therapeutic management and any added complications. The data will be collected in a specially designed data collection form.

RESULTS AND DISCUSSION

A total of 75 pregnant women meeting the inclusion criteria were included in the study. Most participants were aged 26–30 years. The primary reasons for admission were safe confinement (28%), complaints of pain (24%), induction of labour (22.7%), and leaking per vagina (13.3%). The majority of the study population were at a gestational age of 38 weeks, followed by 37 weeks, 39 weeks, and 36 weeks. Regarding medical history, gestational diabetes mellitus (29.3%) were the most common condition, followed by hypothyroidism (18.6%), pregnancy-induced hypertension (6.6%), and polycystic ovary syndrome (5.3%). Vaginal delivery were the predominant mode of delivery (62.7%), with 37.3% undergoing caesarean section. Vaginal swab cultures were obtained from all 75 participants, with 22 (29.3%) testing positive and 53 (70.6%) showing no significant flora (NSF). Among full-term pregnancies (63 cases), 18 (28.5%) had positive cultures, and 45 (71.5%) were NSF, while in preterm pregnancies (12 cases), 4 (33.3%) had positive cultures, and 8 (66.7%) were NSF.

Table 1: Percentage distribution based on age group.

Age	Frequency (N=75)	Percentage (%)
18-25	8	10.7
26-30	41	54.7
>31	26	34.6

Table 2: Percentage distribution of reasons for admission.

Reason for admission	Frequency (N=75)	Percentage (%)
SAFE CONFINEMENT	21	28
INDUCTION OF LABOUR	17	22.7
COMPLAINTS OF PAIN	18	24
ELECTIVE LSCS	6	8
LEAKING PER VAGINA	10	13.3
REDUCED FOETAL MOVEMENTS	3	4

Table 3: Percentage distribution based on gestational age in weeks.

Gestational age (in weeks)	Frequency (N=75)	Percentage (%)
32	1	1.3
33	3	4
35	2	2.7
36	5	6.7
37	24	32
38	27	36
39	10	13.3
40	3	4

Table 4: Percentage distribution of past medical history.

Past medical history	Frequency (n=59)	Percentage (%)
GDM	22	37.2
HYPOTHYROIDISM	14	23.7
PIH	5	8.4
PCOS	4	6.7
ASTHMA	2	3.3
ACUTE GASTROENTERITIS	1	1.6
PELVIC ENDOMETRIOSIS	1	1.6
FIBROID	1	1.6
URTI	1	1.6
IBD	1	1.6
OTHERS	7	11.8

Table 5: Percentage distribution based on mode of delivery.

Mode of delivery	Frequency (N=75)	Percentage (%)
VAGINAL	47	62.7
C- SECTION	28	37.3

Indications of intrapartum antibiotic therapy

In our study, we observed that urinary tract infections (UTIs) and bacterial enteritis emerged as primary infections, each affecting two individuals. An upper respiratory tract infection were also noted in one case. When it came to secondary infections, suspected chorioamnionitis and intrapartum fever were present in two cases each. Additionally, complications such as retroplacental hematoma, placenta previa, placenta percreta, polyhydramnios, and oligohydramnios were each found in one case. Notably, premature rupture of membranes (PROM) were reported in four cases, while preterm premature rupture of membranes (PPROM) were more prevalent, occurring in five cases.

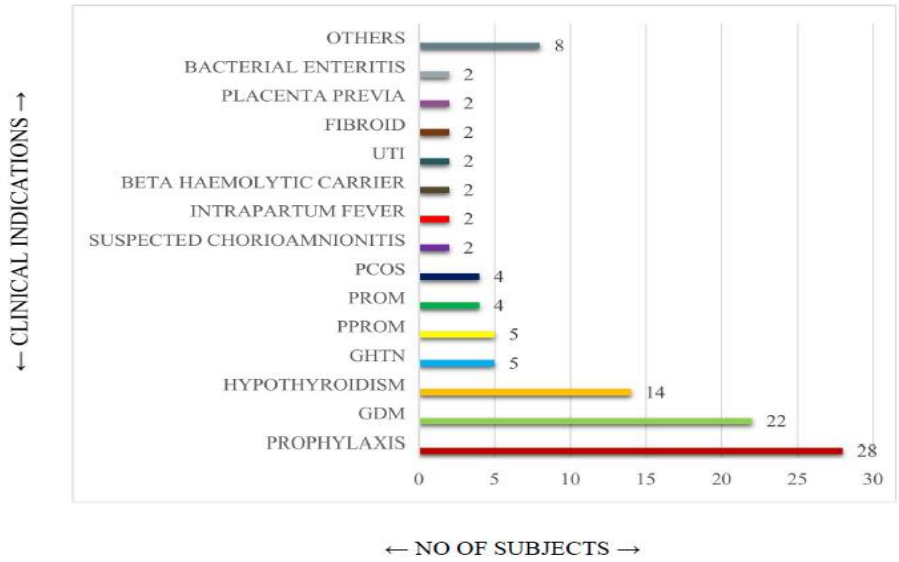

Figure 1: Distribution of clinical indications of intrapartum antibiotic therapy.

The study also highlighted several associated conditions with these infections. Gestational Diabetes Mellitus was the most frequently associated condition, affecting 22 individuals. Hypothyroidism was the next most common, with 14 cases, followed by gestational hypertension in five cases. Other conditions such as Polycystic Ovary Syndrome (PCOS), fibroids, and Beta Hemolytic carrier status were less common but still prevalent. Single cases of macrosomia, bronchial asthma, and pelvic endometriosis were also recorded.

Table 6: Primary, secondary and associated causes of infections in pregnant women.

Primary causes of infection (n)	Secondary causes of infection (n)	Associated causes (n)
UTI (2)	Suspected chorioamnionitis (2)	Gestational Diabetes Mellitus (22)
Bacterial enteritis (2)	Intrapartum fever (2)	Gestational Hypertension (5)
Upper respiratory tract infection (1)	Retroplacental hematoma (1)	Hypothyroidism (14)
	Placenta previa (2)	PCOS (4)
	Placenta percreta (1)	Macrosomia (1)
	PROM (4)	Fibroid (2)
	PPROM (5)	Bronchial asthma (1)
	Polyhydramnios (1)	Pelvic endometriosis (1)
	Oligohydramnios (1)	Beta Haemolytic carrier (2)

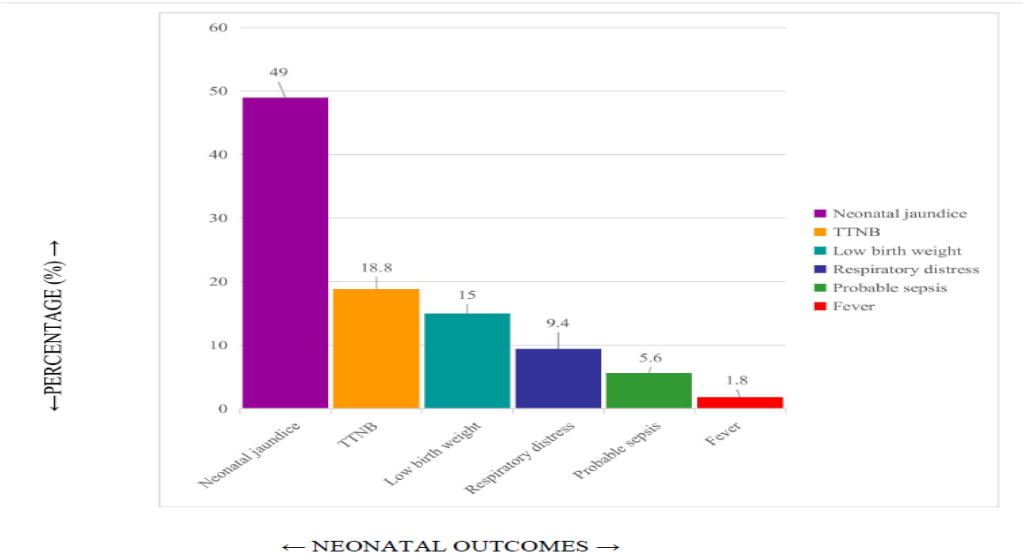

Figure 2: Distribution of neonatal outcomes.

Table 7: Association between gestational age, duration of intrapartum antibiotics, and Neonatal Outcomes.

Sl. No	Demographic variables	Infectious neonatal outcomes		Total	X^2 test
		Present	Absent		
1	**Gestational age**				χ^2= 0.115, df=1, p=0.735 (NS)
	≤ 37	17	18	35	
	>37	21	19	40	
2	**Duration of Intrapartum Antibiotics**				χ^2= 2.552, df=1, p=0.110 (NS)
	≤ 4.00	21	27	48	
	>4.00	17	10	27	

Statistical analysis of neonatal outcomes in relation to gestational age and duration of intrapartum antibiotics

NS: not significant

a. Gestational age

Chi-square value (χ2) = 0.115 Degrees of freedom (df) = 1 p-value = 0.735

Since the p-value is greater than 0.05, we conclude that there is no statistically significant association between gestational age and infectious neonatal outcomes.

b. Duration of intrapartum antibiotics: Chi-square value (χ2) = 2.552

Degrees of freedom (df) = 1 p-value = 0.110

Similarly, the p-value here is also greater than 0.05, indicating no statistically significant association between the duration of intrapartum antibiotics and neonatal outcomes.

In summary, neither gestational age nor the duration of intrapartum antibiotics appears to have a significant impact on neonatal outcomes based on the chi-square tests provided. It's important to note that these conclusions are based on the p-value threshold of 0.05, which is a common standard for statistical significance in many research studies.

DISCUSSION

Intrapartum use of antibiotics refers to the administration of antibiotics to a pregnant woman during labour. This practice is usually employed to prevent or treat infections that could affect both mother and baby. The most common indication for intrapartum antibiotics is Group B Streptococcus (GBS) prophylaxis or certain risk factors to prevent the transmission of the bacteria to the newborn during childbirth.

This study revealed a significant incidence of primary infections such as urinary tract infections (UTIs) and bacterial enteritis, as well as secondary infections like suspected chorioamnionitis and intrapartum fever. These infections, along with complications such as premature rupture of membranes (PROM) and preterm premature rupture of membranes (PPROM), present a multifaceted risk to neonatal health. The high occurrence of Gestational Diabetes Mellitus (GDM) and hypothyroidism among the study participants further complicates the maternal-foetal outcomes.

The interrelation between maternal infections and neonatal outcomes is well-documented, with maternal health directly influencing foetal development and neonatal well-being. The prevalence of GDM in our study is particularly concerning, as it is associated with increased risks of macrosomia and future metabolic issues in offspring. Similarly, hypothyroidism and gestational hypertension are linked to preeclampsia and foetal growth restriction, which can lead to long-term developmental challenges.

In this study 75 neonates were evaluated, the most common condition were neonatal jaundice 34.7%, followed by transient tachypnoea 13.3%, low birth weight 10.7%, respiratory distress 6.7%, probable sepsis 4%, and fever 1.3%. These findings highlight the need for vigilant neonatal care and suggest a potential influence of maternal factors, such as the vaginal microbiota, on neonatal health. The prevalence of these conditions shows the importance of early detection and management to improve neonatal outcomes.

The statistical analysis conducted in this study aimed to explore the relationship between gestational age, the duration of intrapartum antibiotics, and infectious neonatal outcomes. The Chi-square test results indicated no statistically significant association for both variables. For gestational age, the Chi-square value was $\chi 2=0.115$ with degrees of freedom (df) of 1, resulting in a p-value of 0.735. This p-value, being well above the conventional threshold of 0.05, suggests that gestational age does not significantly influence the rate of outcomes in neonates within this study. Similarly, the duration of intrapartum antibiotics yielded a Chi- square value of $\chi 2=2.552$ and a p-value of 0.110. Despite the larger Chi-square value compared to gestational age, the p-value remains above 0.05, reinforcing the conclusion that the duration of antibiotic administration during labour is not significantly associated with infectious outcomes in newborns. These findings suggest that factors other than gestational age and antibiotic duration may influence neonatal outcomes.

CONCLUSION

The prevalence of GDM in our study is particularly concerning, as it is associated with increased risks of macrosomia and future metabolic issues in offspring. Similarly, hypothyroidism and gestational hypertension were linked to preeclampsia and foetal growth restriction, which can lead to long-term developmental challenges. These findings highlighted the need for cautious neonatal care and suggest a potential influence of maternal factors, such as the vaginal microbiota, on neonatal health.

LIMITATIONS

The study was conducted over a relatively short duration of six months, which may limit the generalizability of the findings. In addition, some patients were unwilling or unaware of the potential benefits of antibiotic use at delivery and related outcomes, which was a limiting factor in their willingness to participate in the study. This lack of awareness may have affected the results, as patients who declined to participate could have had different health outcomes compared to those who participated. Variability in intrapartum antibiotic prescribing practices between healthcare providers or institutions could introduce bias. Factors such as maternal comorbidities, gestational age, and delivery method (e.g., cesarean vs. vaginal delivery) may influence neonatal outcomes independently of antibiotic use. The study may not explore non-infectious neonatal outcomes (e.g., microbiome alteration or allergy risk) resulting from intrapartum antibiotic use.

ACKNOWLEDGEMENT

We take this opportunity to express our deep sense of gratitude and respectful regards to Dr. Susan Joseph MD, DGO, DNB, MRCOG(UK), Dr. Suma Sarah Kurian MBBS, DGO and Dr. Athira Raju MBBS, MS OBG, DNB OBG, SH Medical Centre, Kottayam for their immense support, encouragement, and credible ideas, which have been great contributors to the completion of this thesis. We are also thankful to the Management, Nursing Staff, and all other Staffs of SH Medical Centre, Kottayam, for their immense support. We sincerely express our gratitude and respect to Mr. Manu K Joseph who helped us a lot in the statistics section.

DECLARATION
Funding: No funding sources Conflict of interest: None declared.

Ethical approval: The study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST
The authors declare no conflict of interest in conducting this study, the design, data collection, analysis, interpretation, reporting its findings or publication of this research.

REFERENCE
1. Miller YD, Armanasco AA, McCosker L, Thompson R. Variations in outcomes for women admitted to hospital in early versus active labour: an observational study. BMC pregnancy and childbirth, 2020; 20: 1-0.
2. Chan GJ, Lee AC, Baqui AH, Tan J, Black RE. Risk of early-onset neonatal infection with maternal infection or colonization: a global systematic review and meta-analysis. PLoS medicine, 2013; 20, 10(8): e1001502.
3. Truong WR, Hidayat L, Bolaris MA et al. The antibiogram: key considerations for its development and utilization. JAC-antimicrobial resistance, 2021; 1, 3(2): dlab060.
4. Zoli SI, Baiti MA, Alhazmi AA et al. Factors affecting awareness of pregnancy screening for group B streptococcus infection among women of reproductive age in Jazan Province, Saudi Arabia. JMDH, 2023; 31: 2109-16.
5. Chen X, Cao S, Fu X et al. The risk factors for Group B Streptococcus colonization during pregnancy and influences of intrapartum antibiotic prophylaxis on maternal and neonatal outcomes. BMC Pregnancy and Childbirth, 2023; 27, 23(1): 207.
6. McCoy JA, Bromwich K, Gerson KD et al. Association between intrapartum antibiotic prophylaxis for Group B Streptococcus colonization and clinical chorioamnionitis among patients undergoing induction of labour at term. AJOG, 2023; 1, 229(6): 672-e1.
7. Champion ML, Jauk VC, Szychowski JM et al. Duration of intrapartum ampicillin prophylaxis and neonatal outcomes. AJOG, 2022; 1, 226(1): S557.
8. Cate J, Illuzzi JL, Cayton C. Duration of Intrapartum Antibiotic Prophylaxis for Group B Streptococcus [06A]. Obstetrics & Gynaecology, 2020; 1, 135: 10S.
9. Knight M, Chiocchia V, Partlett C et al. Prophylactic antibiotics in the prevention of infection after operative vaginal delivery (ANODE): a multicentre randomised controlled trial. The Lancet, 2019; 15, 393(10189): 2395-403.
10. Braye K, Foureur M, de Waal K et al. Group B streptococcal screening, intrapartum antibiotic prophylaxis, and neonatal early-onset infection rates in an Australian local health district: 2006- 2016. PLoS One, 2019; 4, 14(4): e0214295.
11. Shree R, Caughey AB, Chandrasekaran S. Short interpregnancy interval increases the risk of preterm premature rupture of membranes and early delivery. J. Matern. -Fetal Neonatal Med, 2018; 17, 31(22): 3014-20.
12. Toyofuku M, Morozumi M, Hida M et al. Effects of intrapartum antibiotic prophylaxis on neonatal acquisition of group B streptococci. TJP, 2017; 1, 190: 169-73.
13. Corvaglia L, Tonti G, Martini S et al. Influence of intrapartum antibiotic prophylaxis for group B streptococcus on gut microbiota in the first month of life. JPGN, 2016; 1, 62(2): 304-8.
14. Azad MB, Konya T, Persaud RR et al. Impact of maternal intrapartum antibiotics, method of birth and breastfeeding on gut microbiota during the first year of life: a prospective cohort study. BJOG: IJOG, 2016; 123(6): 983-93.
15. Fairlie T, Zell ER, Schrag S. Effectiveness of intrapartum antibiotic prophylaxis for prevention of early-onset group B streptococcal disease. Obstetrics & Gynaecology, 2013; 1, 121(3): 570-7.
16. Turrentine M, Greisinger A, Brown K et al. 739: Duration of intrapartum antibiotics for Group B streptococcus on the diagnosis of neonatal sepsis. AJOG, 2013; 1, 208(1): S311.
17. Lin CY, Hsu CH, Huang FY et al. The changing face of early-onset neonatal sepsis after the implementation of a maternal group B Streptococcus screening and intrapartum prophylaxis policy— a study in one medical center. Paediatrics & Neonatology, 2011; 1, 52(2): 78-84.
18. Edwards RK, Jamie WE, Sterner D et al. Intrapartum antibiotic prophylaxis and early-onset neonatal sepsis patterns. Infectious diseases in obstetrics and gynaecology, 2003; 1, 11: 221-6.
19. Baltimore RS, Huie SM, Meek JI et al. Early-onset neonatal sepsis in the era of group B streptococcal prevention. Pediatrics, 2001; 1, 108(5): 1094-8.
20. Sinha. A, Yokoe D, Platt R. Intrapartum antibiotics and neonatal invasive infections caused by organisms other than group B streptococcus. JOP, 2003; 1, 142(5): 492-7.